MATHS

BOOKS - NAVBODH MATHS (HINGLISH)

QUESTION BANK 2021

PART-1 (MATHEMATICAL LOGIC)

1. Which of the following statement is true

A. $3 + 7 = 4$ or $3 - 7 = 4$

B. If Pune is in Maharashtra, then Hyderabad is in Kerala

C. It is false that 12 is not divisible by 3

D. The square of any odd integer is even.

Answer: C

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2. Which of the following is not a statement

A. 2+2 =4

B. 2 is the only even prime number

C. Come here

D. Mumbai is not in Maharashtra

Answer: C

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3. If p is any statement then $(p \vee \sim p)$ is a

A. Contingency

B. Contradiction

C. Tautology

D. None of these

Answer: C

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4. If p and q are two statements , then $(p \rightarrow q) \Rightarrow (\sim p \rightarrow \sim p)$ is

A. Contradiction

B. Tautology

C. Neither (i) nor (ii)

D. None of these

Answer: B

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5. Negation of $p \rightarrow (p \vee \sim q)$ is

A. $\sim p \rightarrow (\sim p \vee q)$

B. $p \wedge (\sim p \wedge q)$

C. $\sim p \vee (\sim p \vee \sim q)$

D. $\sim p \rightarrow (\sim p \rightarrow q)$

Answer: B

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6. Consider the following statements :

p: He is intelligent

q: He is strong

Then symbolic form of statements 'it is wrong that he is intelligent or strong's

A. $\sim p \vee \sim q$

B. $\sim(p \wedge q)$

C. $\sim(p \wedge q)$

D. $p \vee \sim q$

Answer: C

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7. A biconditional statement is the conjunction of two ---------------- statements:

A. Negative

B. Compound

C. Connective

D. Conditional

Answer: D

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8. If $p \rightarrow q$ is an implication, then the implication $\sim q \rightarrow \sim p$ is called its:

(A) Converse

(B) Contrapositive

(C) Inverse

(D) Alternative

A. Converse

B. Contrapositive

C. Inverse

D. Alternative

Answer: B

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9. The dual of the statement $(p \vee q) \wedge (r \vee s)$

A. $(p \wedge q) \wedge (r \wedge s)$

B. $(p \wedge q) \vee (r \wedge s)$

C. $(p \vee q) \vee (r \vee s)$

D. $(p \vee q) \wedge (r \vee s)$

Answer: B

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10. The false statement in the following is

A. $p \wedge (\sim p)$ is contradiction

B. $(p \rightarrow q) < \Rightarrow (\sim q \rightarrow \sim p)$ is a contradiction

C. $\sim(\sim p) < \Rightarrow P$ is a tautology

D. $p \vee (\sim p) < \Rightarrow p$ is a tautology

Answer: B

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11. The negation of 10 + 20 = 30 is, "it is false that 10 + 20 ≠ 30". (True/False)

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12. State whether the given statements are true or false

$x^2 = 25$ is true statement

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13. State whether the given statements are true or false

$p \rightarrow q$ is equivalent to $p \rightarrow \sim q$

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14. State whether the given statements are true or false

Truth value of $\sqrt{3}$ is not an irrational number is F

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15. State whether the given statement is true or false:

$(p \vee q) \wedge \sim p$ is a contradiction.

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16. State whether the given statements are true or false

$p \Rightarrow q$ is false when p and q have different truth values

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17. State whether the given statements are true or false

The dual of $(p \wedge q) \vee \sim q$ is $(p \vee q) \wedge \sim q$

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18. State whether the given statements are true or false

Mathematical identities are true statements

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19. State whether the given statements are true or false

$p \vee \sim p \equiv \sim c$

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20. State whether the given statement is true or false:

The converse of inverse of $\sim p \rightarrow q$ is $q \rightarrow \sim p$

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21. Conjunction of two statement pattern p and q is symbolically written as ------

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22. Negation of “Some men are animal “ is_______.

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23. The negation of " London is in England " is _________.

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24. The truth value of the statement " Neither 27 is a prime number nor divisible by 4" is ---------

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25. The contrapositive of $p \rightarrow \sim q$ is ------

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26. Write the negation of the statement "An angle is a right angle if and only if it is of measure 90°"

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27. Answer the following questions

Write the following statements in symbolic form

(a) Milk is white if and only if the sky is not blue

(b) If Kutab - Minar is in Delhi then Taj - Mahal is in Agra

(c) Even though it is not cloudy, it is still raining

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28. Use quantifiers to convert the given open sentence defined on N into a true statement

(a) $n^2 \geq 1$

(b) $3x$ - $4 < 9$

(c) $Y + 4 > 6$

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29. Answer the following questions

Examine whether the statement pattern is a tautology, contradiction or contingency

$(p \wedge \sim q) \rightarrow (\sim p \wedge \sim q)$

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30. Using truth table prove that $\sim p \wedge q$

$\equiv (p \vee q) \wedge \sim p$

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31. Write the dual of the following

a) 13 is prime number and India is a democratic country

(b) $(p \wedge \sim q) \vee (\sim p \wedge q)$

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32. Answer the following questions

Write the converse, inverse and contrapositive of the statement "If it snows, then they do not drive the car"

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33. Using truth table prove that

$p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$

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34. With proper justification state the negation of

$(p \rightarrow q) \vee (\sim q \rightarrow \sim p)$

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35. Prepare truth table for $(p \wedge q) \vee \sim r$

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36. Given following statements

P : 9 x 5 = 45

q : Pune is in Maharashtra

r : 3 is the smallest prime number

Write truth values by activity

i) $(p \wedge q) \wedge r = (\square \wedge \square) \wedge \square$

$= \square \wedge \square$

$= \square$

ii) $\sim (p \wedge r) = \sim (\square \wedge \square)$

$= \sim \square$

$= \square$

iii) $p \rightarrow q = \square \rightarrow \square$

$= \square$

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37. Complete the truth table

p	q	r	$q \to r$	$r \to p$	$(q \to r) \vee (r \to p)$
T	T	T	T	□	T
T	T	F	F	□	□
T	F	T	T	□	T
T	F	F	T	□	□
F	T	T	□	F	T
F	T	F	□	T	□
F	F	T	□	F	T
F	F	F	□	T	□

The given statement pattern is -

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PART-1 (MATRICES)

1. If $A=\begin{bmatrix}6 & 0\\ p & q\end{bmatrix}$ is a scalar matrix then the value of p and q are

A. 6 and 0

B. 0 and 6

C. 5 and 6

D. 0 and 1

Answer: B

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2. If $B = \begin{bmatrix} 6 & 3 \\ -2 & k \end{bmatrix}$ is singular matrix then the value of k is____

A. -1

B. 2

C. 0

D. 1

Answer: A

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3. If $A = \begin{bmatrix} 1 & \frac{3}{5} & x \\ y & -5 & -7 \\ -4 & -7 & 0 \end{bmatrix}$ is a symmetric matrix then the value of x and y are ______

A. $\frac{3}{4}$ and 4

B. $\frac{5}{3}$ and -4

C. $\frac{3}{5}$ and -4

D. -4 and $\frac{3}{5}$

Answer: D

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4. $\begin{bmatrix} 3 & 2 & 1 \end{bmatrix} \begin{bmatrix} 2 \\ -2 \\ -1 \end{bmatrix}$ = ______

A. [2]

B. 1

C. [1]

D. 2

Answer: C

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5. If $A = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$ then $A^2 - 3I$=......

A. O

B. I

C. A

D. 3A

Answer: B

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6. If A is a square matrix, then $A + A^T$ is

A. Null matrix

B. Identity matrix

C. Symmetric matrix

D. Skew symmetric matrix

Answer: C

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7. If A and B are any two square matrices of the same order then (A) $(AB)^t = A^t B^t$ (B) $(AB)^t = B^t A^t$ (C) $Adj(AB) = adj(A)adj(B0$ (D) $AB = 0 \rightarrow A = 0 \text{ or } B = 0$

A. $B^T A^T$

B. $A^T B^T$

C. $(BA)^T$

D. 1

Answer: A

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8. If $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$ then adj A=

A. $\begin{bmatrix} 1 & -2 \\ 2 & -1 \end{bmatrix}$

B. $\begin{bmatrix} -1 & 2 \\ 2 & 1 \end{bmatrix}$

C. $\begin{bmatrix} -1 & -2 \\ -2 & 1 \end{bmatrix}$

D. $\begin{bmatrix} 1 & 2 \\ -2 & 1 \end{bmatrix}$

Answer: C

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9. If A is a non singular matrix of order 3 then $|adj(A)| =$

....

A. $|A|^2$

B. $|A|^3$

C. 0

D. 1

Answer: A

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10. If $A^2 + 5A + 3I = 0, |A| \neq 0$ then A^{-1}=...................

A. $-\frac{1}{3}(A+5I)$

B. $-\frac{1}{5}(A+3I)$

C. $(A+5I)$

D. $-\frac{1}{3}(I+5A)$

Answer: A

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11. If A is non singular then $|A| = 0$. True or False.

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12. Inverse of $\begin{bmatrix} 2 & 0 \\ 0 & 3 \end{bmatrix}$ is $\begin{bmatrix} \frac{1}{2} & 0 \\ 0 & \frac{1}{3} \end{bmatrix}$ True or False.

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13. If $\begin{bmatrix} 3 & 0 \\ 0 & 2 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$, then x=1 and y=-1. True or False.

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14. Representation of matrix as the sum of symmetric and skew symmetric matrix

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15. If $A = \begin{bmatrix} 1 & 2 & -5 \\ 2 & -3 & 4 \\ -5 & 4 & 9 \end{bmatrix}$, then $A^T = A$. True or False

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16. Matrix $\begin{bmatrix} a & b & c \\ p & q & r \\ 2a - p & 2b - q & 2c - r \end{bmatrix}$ is singular. True or False.

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17. $\begin{bmatrix} 2 & 0 & 0 \\ 3 & -1 & 0 \\ -7 & 3 & 1 \end{bmatrix}$ is a skew symmetric matrix. True or False.

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18. If A is an $m \times n$ matrix and B is $n \times p$ matrix does AB exist? If yes, write its order.

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19. After applying elementary transformation $R_1 - 3R_2$ on matrix $\begin{bmatrix} 3 & -2 \\ 1 & 4 \end{bmatrix}$ we get $\begin{bmatrix} 0 & -12 \\ 1 & 4 \end{bmatrix}$. True or False.

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20. If A and B are two square matrices such that AB=BA then $(A - B)^2 = A^2 - 2AB + B^2$. True or False.

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PART-1 (MATRICES) [FILL IN THE BLANKS)

1. If $A = \mid a_{ij}]_{2 \times 2}$ where $a_{ij} = i - j$ then A =............

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2. In a skew-symmetrix matrix, the diagonal elements are all

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3. If $A = \begin{bmatrix} 1 & -2 \\ 5 & 3 \end{bmatrix}, B = \begin{bmatrix} 1 & -3 \\ 4 & -7 \end{bmatrix}$ then A-3B = ...

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4. if $A = \begin{bmatrix} 4 & 3 & 2 \\ -1 & 2 & 0 \end{bmatrix}, B = \begin{bmatrix} 1 & 2 \\ -1 & 0 \\ 1 & -2 \end{bmatrix}$ then |AB| = ...

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5. The value of Cofactor of element a_{21} in matrix

$A = \begin{bmatrix} 1 & 2 \\ 5 & -8 \end{bmatrix}$ is ....

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6. The value of Minor of element b_{22} in matrix

$B = \begin{bmatrix} 2 & -2 \\ 4 & 5 \end{bmatrix}$ is ....

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7. If matrix form of given equations $3x - y = 1$ and $y + 4x = 6$ is AX = B then $A =$?

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8. The suitable elementary row transformation which will reduce the matrix $\begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix}$ into identity matrix is ______

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9. If A $= \begin{bmatrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ then adj(A) =

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10. If A is a square matrix of order 2 such that A(adjA) $= \begin{bmatrix} 7 & 0 \\ 0 & 7 \end{bmatrix}$ then |A|=..................

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PART-1 (MATRICES) [SOLVE THE FOLLOWING]

1. If $A = \begin{bmatrix} 1 & 2 \\ -1 & -2 \end{bmatrix}, B = \begin{bmatrix} 2 & a \\ -1 & b \end{bmatrix}$ and $(A+B)^2 = A^2 + B^2$, then find the value of a and b.

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2. Find matrices A and B, if $2A - B = \begin{bmatrix} 6 & -6 & 0 \\ -4 & 2 & 1 \end{bmatrix}$ and

$A - 2B = \begin{bmatrix} 3 & 2 & 8 \\ -2 & 1 & 7 \end{bmatrix}$

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3. if $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, show that $A^2 - 5A + 7I = 0$.

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4. If $A = [3 - 24 - 2]$, find k such that $A^2 - kA - 2I_2$.

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5. if $A = \begin{bmatrix} 2 & 1 \\ 0 & 3 \\ 1 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 3 & 5 \\ 1 & -7 & 2 \end{bmatrix}$, then verify $(BA)^T = A^T B^T$.

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6. Find the inverse of matrix $B = \begin{bmatrix} 3 & 1 & 5 \\ 2 & 7 & 8 \\ 1 & 2 & 5 \end{bmatrix}$ by using adjoint method.

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PART-1 (MATRICES) [4 MARKS]

1. Find the inverse of the matrix $\begin{pmatrix} 1 & 0 & 1 \\ 0 & 2 & 3 \\ 1 & 2 & 1 \end{pmatrix}$ by using elementary column transformations .

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2. Solve the following equations by using method of inversion:

$4x - 3y - 2 = 0, 3x - 4y + 6 = 0$

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3. Solve the following equations by method of reduction

$x - 3y + z = 2, 3x + y + z = 1, 5x + y + 3z = 3$

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4. The sum of three numbers is 6. If we multiply third number by 3 and add second number to it, we get 11. By adding first and third numbers, we get double of the second number. Represent it algebraically and find the numbers using matrix method.

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5. The total Cost of 3 T.V and 2 V.C.R is ₹ 35000. The shopkeeper wants profit of ₹1000 per T.V and ₹ 500 per V.C.R. He sell 2 T.V. and 1 VCR and he gets total revenue as ₹21500. Find the cost and selling price of T.V and V.C.R.

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PART-1 (DIFFERENTIATION) (CHOOSE THE CORRECT ALTERNATIVES)

1. If $y=\frac{1}{\sqrt{3x^2-2x-1}}$ then $\frac{dy}{dx}$ =?

A. $-\frac{2}{3}(3x-2)\left(3x^2-2x-1\right)^{-\frac{3}{2}}$

B. $-\frac{3}{2}(3x-2)\left(3x^2-2x-1\right)^{-\frac{3}{2}}$

C. $(3x-1)\left(3x^2-2x-1\right)^{-\frac{3}{2}}$

D. $-(3x-1)\left(3x^2-2x-1\right)^{-\frac{3}{2}}$

Answer: D

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2. If $y = \sqrt[3]{\left(3x^2 + 8x - 6\right)^5}$ then $\frac{dy}{dx}$ =?

A. $\frac{5}{3}(6x + 8)\left(3x^2 + 8x - 6\right)^{\frac{3}{2}}$

B. $-\frac{5}{3}(6x + 8)\left(3x^2 + 8x - 6\right)^{\frac{2}{3}}$

C. $\frac{3}{5}(3x + 4)\left(3x^2 + 8x - 6\right)^{\frac{2}{3}}$

D. $-\frac{3}{5}(3x + 4)\left(3x^2 + 8x - 6\right)^{\frac{2}{3}}$

Answer: A

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3. What is the rate of change of demand (x) of a commodity with respect to it's price (y) If $y = 10 + x + 25x^3$

A. $\dfrac{10}{1 + 75x^2}$

B. $\dfrac{1}{1 + 75x^2}$

C. $1 + 75x^2$

D. $-\dfrac{1}{1 + 75x^2}$

Answer: B

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4. What is the rate of change of demand (x) of a commodity with respect to it's price (y) if $y = \frac{3x + 7}{2x^2 + 5}$

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5. If $y = x\sqrt{x}$ then $\frac{dy}{dx}$ =?

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6. If $y = (x)^x + 10^x$ then $\frac{dy}{dx}$ =?

A. $x^x(1 + \log x) + 10^x \log 10$

B. $x^x(1 + \log x) - 10^x \log 10$

C. $x(1+\log x)+10^{x}\log 10$

D. $x^{x}(1+\log x)+10^{x}\log 10$

Answer: D

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7. If $x^{m}.y^{n}=(x+y)^{m+n}$ then $\frac{dy}{dx}$ is:

A. $\frac{y}{x}$

B. $-\frac{y}{x}$

C. $\frac{x}{y}$

D. $-\frac{x}{y}$

Answer: A

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8. If $x^y = 2^{x-y}$, then $\frac{dy}{dx}$=?

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9. If $x = 2am, y = 2am^2$ where m be the parameter then $\frac{dy}{dx}$ =?

A. 2m

B. $-2m$

C. $-am$

D. am

Answer: A

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10. If $x = a\left(t - \frac{1}{t}\right), y = a\left(t + \frac{1}{t}\right)$, where t be the parameter, then $\frac{dy}{dx} = ?$

A. $\frac{x}{y}$

B. $-\frac{x}{y}$

C. $\frac{y}{x}$

D. $-\frac{y}{x}$

Answer: A

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11. $x = at^2, y = 2at,$

A. $\frac{1}{at^3}$

B. - $\frac{1}{at^3}$

C. - $\frac{1}{at^2}$

D. $\frac{1}{at^2}$

Answer: B

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PART-1 (DIFFERENTIATION) (FILL IN THE BLANKS)

1. $y = \left(5x^3 - 4x^2 - 8x\right)^9, find \dfrac{dy}{dx}$

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2. If $y = a^{1 + \log x}$ then $\dfrac{dy}{dx}$ is..........

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3. The rate of change of demand (x) of a commodity with respect to it's price (y) is............. if $y = 5 + x^2 e^{-x} + 2x$

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4. The rate of change of demand (x) of a commodity with respect to it's price (y) is................ If $y = xe^{-x} + 7$

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5. If $y = x^{10}$ then $\frac{dy}{dx}$ is..........

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6. If $y = (e)^{2x+5}$, then $\frac{dy}{dx}$ is..........

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7. If $\sqrt{x}+\sqrt{y}=\sqrt{a}$, then $\frac{dy}{dx}=$

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8. Differentiatr 5^x with respect to logx

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9. Differentiate e^x with respect to $\log_e x$

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10. If $y=x^2$ then $\frac{d^2y}{dx^2}$ is............

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PART-1 (DIFFERENTIATION) (State whether each of the following is True or False :)

1. If $y = \log(\log x)$ then $\dfrac{dy}{dx} =$

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2. If $y = 10^x + 1$, then $\dfrac{dy}{dx} = 10^x . \log 10$

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3. If $y = x^2$ then the rate of change of demand (x) of a commodity with respect to it's price (y) is $\frac{1}{2x}$

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4. State whether the statement is True or False:

If $y = 7x + 1$, then the rate of change of demand (x) of a commodity with respect to it's price (y) is 7.

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5. If $y = e^x$, then $\frac{dy}{dx} = e^x$ (True/False)

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6. If $y = 4^x$, then $\frac{dy}{dx} = 4^x$

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7. If $\sqrt{x} + \sqrt{y} = \sqrt{a}$, then $\frac{dy}{dx} = \frac{1}{2\sqrt{x}} + \frac{1}{2\sqrt{y}} = \frac{1}{2\sqrt{a}}$

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8. If $x^2 + y^2 = a^2$ then $\frac{dy}{dx} = \ldots$

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9. If x= 2at , y= 2a , where t is parameter, then $\frac{dy}{dx} = \frac{1}{t}$.

(True/False)

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10. If x= 5m, y= m , where m is parameter, then $\frac{dy}{dx} = \frac{1}{5}$.

(True/False)

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11. If $y = e^x$, then $\frac{d^2y}{dx^2} = e^x$.

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PART-1 (DIFFERENTIATION) (Solve the following : (3 Marks))

1. Find $\frac{dy}{dx}$, if $y = [\log(\log(\log x))]^2$

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2. Find $\frac{dy}{dx}$, if $y = \left(6x^3 - 3x^2 - 9x\right)^{10}$

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3. The rate of change of demand (x) of a commodity with respect to it's price (y) is.............. if $y = 5 + x^2e^{-x} + 2x$

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4. The rate of change of demand (x) of a commodity with respect to it's price (y) is.............. if $y = 5 + x^2 e^{-x} + 2x$

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5. Find $\frac{dy}{dx}$ of $x^y = y^x$

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6. Find $\frac{dy}{dx}$, if $xy = \log(xy)$

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7. If $x = \sqrt{1 + u^2}, y = \log\left(1 + u^2\right), then \frac{dy}{dx} =$

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8. If $x = t\log t, y = t^t, then \frac{dy}{dx} =$

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9. Find $\frac{d^2y}{dx^2}$, if $y = e^{2x+1}$

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PART-1 (DIFFERENTIATION) (Solve the following : (4 Marks))

1. Find $\frac{dy}{dx}$, if $y = (\log x)^x + (x)^{\log x}$

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2. Find $\frac{dy}{dx}$, if $y = \sqrt[5]{\left(3x^2 + 8x + 5\right)^4}$

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3. Find $\frac{dy}{dx}$, if $y = x^x + (7x - 1)^x$

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4. Find rate of change of demand (x) of a commodity with respect to it's price (y) if

$$y = \frac{3x + 7}{2x^2 + 5}$$

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5. Find $\frac{dy}{dx}$ of $y = x^{x^x}$

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6. Find $\frac{dy}{dx}$, if $y = \sqrt[3]{\frac{3x - 1}{(2x + 3)(5 - x)^2}}$

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7. $x^5 . y^7 = (x + y)^{12}$

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8. $x^a y^b = (x + y)^{a+b}$ prove that $\frac{dy}{dx} = \frac{y}{x}$

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9. If $x = \frac{4t}{1 + t^2}, y = 3\left(\frac{1 - t^2}{1 + t^2}\right)$, then, show that $\frac{dy}{dx} = \frac{-9x}{4y}$

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10. If $x^2 + 6xy + y^2 = 10$, Show that $\frac{d^2y}{dx^2} = \frac{80}{(3x + y)^3}$.

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PART-1 (DIFFERENTIATION) (ACTIVITY)

1. $y = \left(6x^4 - 5x^3 + 2x + 3\right)^6$ find $\frac{dy}{dx}$

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2. The rate of change of demand (x) of a commodity with respect to it price (y), if $y = 20 + 15x + x^3$

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3. Find $\frac{dy}{dx}$, if $y = x^x + 20^x$

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4. Find $\frac{dy}{dx}$, if $x = e^m, y = e^{\sqrt{m}}$

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PART-1 (APPLICATIONS OF DERIVATIVE) (Choose the correct alternative)

1. The equation of normal to the curve $y = x^3 - x^2 - 1$ at the point whose abscissa is -2, is

A. -8

B. 8

C. 16

D. -16

Answer: C

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2. The slope of the tangent to the curve $2x^2 + 3y^2 = 5$ at the point whose abscissa is -2, is

A. $-\frac{2}{3}$

B. $\frac{2}{3}$

C. $\frac{3}{2}$

D. $-\frac{3}{2}$

Answer: C

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3. The function $f(x) = x^3 - 3x^2 + 3x - 100, x \in R$ is:

A. increasing for all $x \in R, x \neq 1$

B. decreasinig

C. Neither increasing nor decreasing

D. Decreasing for all $x \in R, x \neq 1$

Answer: A

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4. If the marginal revenue is 28 and elasticity of demand is 3 then the price is:

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5. The price P for the demand D is given as $P = 183 + 120D - 3D^2$ then the value of D for which price is increasing, is:

A. $D < 60$

B. $D > 60$

C. $D < 20$

D. $D > 20$

Answer: C

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6. If the elasticity of the demand $\eta = 1$ then demand is

A. constant

B. in elastic

C. unitary elastic

D. elastic

Answer: C

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7. If $0 < \eta < 1$, then the demand is

A. constant

B. in elastic

C. unitary elastic

D. elastic

Answer: B

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PART-1 (APPLICATIONS OF DERIVATIVE) (Fill in the blanks)

1. The slope of tangent at any point (a,b) is also called as ....

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2. If the function $f(x) = \frac{7}{x} - 3, x \in R, x \neq 0$, is decreasing function then $x \in$ ....

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3. The slope of the tangent to the curve $x = \frac{1}{t}, y = t - \frac{t}{t}$, at t=2 is ....

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4. If the average revenue is 45 and elasticity of demand is 5 then marginal revenues is.......

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5. The total cost function for production of articles is given as C = $100 + 600x - 3x^2$ then the values of x for which the total cost is decreasing is ....

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PART-1 (APPLICATIONS OF DERIVATIVE) (State whether each of the following is True or False)

1. An absolute maximum or minimum must occur at a critical point or at an end point

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2. The function $f(x) = \frac{3}{x} + 10, x \neq 0$ is decreasing

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3. The function $f(x) = x - \frac{1}{x}, x \in R, x \neq 0$ is increasing

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4. The equation of tangent to the curve $y = x^2 + 4x + 1$ at $(-1, -2)$ is $2x - y = 0$ ` true or false

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5. If the function $f(x) = x^2 + 2x - 5$ is increasing function then $x < -1$.

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6. If the marginal revenue is 50 and the price is Rs 75 then elasticity of demand is 4.

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PART-1 (APPLICATIONS OF DERIVATIVE) (Solve the following 3 Marks)

1. Find the equation of tangent and normal to the curve $y = 3x^2 - x + 1$ at the point (1,3) on it.

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2. Find the values of x, such that $f(x) = 2x^3 - 15x^2 + 36x + 1$ is (i) increasing function

(ii) decreasing function

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3. Find the values of x such that $f(x) = \frac{x - 2}{x + 1}, x \neq -1$ is decreasing function

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4. Show that the function $f(x) = \frac{x - 2}{x + 1}, x \neq -1$ is increasing.

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5. Divide the number 20 into two parts such that their product is maximum.

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6. If the demand function is $D = 50 - 3p - p^2$. Find the elasticity of demand at (i) p=5, (ii) p=2. Comment on the result.

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7. If the demand function is $D = \frac{p+6}{p-3}$ Find the elasticity of demand at p = 4.

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8. The total cost of manufacturing x articles $C = 47x + 300x^2 - x^4$.

Find x for which average cost is (i) increasing (ii) decreasing

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9. Determine the maximum and minimum values of the function f(x) = $2x^3 - 21x^2 + 36x - 20$

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10. A rod of 108m long bent to form a rectangle. Find it's dimensions when it's area is maximum.

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11. Find MPC, MPS, APC and APS , if the expenditure E_c of a person with income I is given as $E_c = (0.0003)I^2 + (0.075)I$, when I = 1000

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12. The manufacturing company produces x items at the total cost of Rs 180 + 4x . The demand function for this product is P = (240 −x) . Find x for which

(i) revenue is increasing (ii) profit is increasing.

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13. If $x + y = 3$ then show that the maximum value of x^2y is 4.

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14. Find the equation of tangent to the curve $x^2 + y^2 = 8$, where the tangent is parallel to the line $2x - 2y + 1 = 0$

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15. Find the equation of normal to the curve $y = \sqrt{x - 3}$ which is perpendicular to the line $6x + 3y - 4 = 0$

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16. Find the equation of tangent to the curve ?$y = x^2 + 4x$ at the point whose ordinate is 5

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PART-1 (APPLICATIONS OF DERIVATIVE) (Activity (4 Marks))

1. A metal wire of 36 cm long is bent to form a rectangle. Find its dimensions when its area is maximum.

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2. Examine the function $f(x) = x^3 - 9x^2 + 24x$ for maxima and minima.

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3. By completing the following activity, find the values of x such that

$f(x) = 2x^3 - 15x^2 - 84x - 7$ is (i)decreasing function.

(ii) increasing function

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4. A manufacturing company produces x items at a total cost of Rs $40 + 2x$. Their price per item is given as $p = 120 - x$ Find the value of x for which (i) revenue is increasing (ii) profit is increasing

Also find elasticity of demand for price Rs. 80.

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PART-1 INTEGRATION CHOOSE THE CORRECT ANSWER

1. The value of $\int \frac{dx}{\sqrt{a - x}}$

A. $2\sqrt{a - x} + c$

B. $-2\sqrt{a - x} + c$

C. $\sqrt{x} + c$

D. $x + c$

Answer: B

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2. $\int \sqrt{1+x}dx =$

A. $\frac{2}{3}\sqrt{1+x}+c$

B. $\frac{2}{3}(1+x)^{3/2}+c$

C. $\frac{2}{\sqrt{1+x}}+c$

D. $\frac{-3}{2}(1+x)+c$

Answer: B

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3. $\int x^2 3^{x^3} dx =$

A. $(3)^{x^3}+c$

B. $\frac{(3)^{x^3}}{3\log 3} + c$

C. $\log 3.\ (3)^{x^3} + c$

D. $x^2(3)^{x^2} + c$

Answer: B

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4.

$$\int \frac{x+2}{2x^2+6x+5}dx = p\int \frac{4x+6}{2x^2+6x+5}dx + \frac{1}{2}\int \frac{1}{2x^2+6x+5}dx$$

then p

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. $\frac{1}{4}$

D. 2

Answer: C

Watch Video Solution

5. $\int \frac{dx}{x - x^2} =$

A. $\log x - \log(1 - x) + c$

B. $\log\left(1 - x^2\right) + c$

C. $-\log x + \log(1 - x) + c$

D. $\log\left(x - x^2\right) + c$

Answer: A

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6. $\int \frac{dx}{(x - 8)(x + 7)} =$

A. $\frac{1}{15}\log\left(\frac{x + 2}{x - 1}\right) + c$

B. $\frac{1}{15}\log\left(\frac{x + 8}{x + 7}\right) + c$

C. $\frac{1}{15}\log\left(\frac{x - 8}{x + 7}\right) + c$

D. $(x - 8).\,(x - 7) + c$

Answer: C

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7. $\int \left(x + \frac{1}{x}\right)^3 dx =$

A. $\frac{1}{4}\left(x + \frac{1}{x}\right)^4 + c$

B. $\frac{x^4}{4} + \frac{3x^2}{2} + 3\log x - \frac{1}{2x^2} + c$

C. $\frac{x^4}{4} + \frac{3x^2}{2} + 3\log x + \frac{1}{x^2} + c$

D. $\left(x - x^{-1}\right)^3 + c$

Answer: B

Watch Video Solution

8. $\int \frac{\left(e^{2x} + e^{-2x}\right)}{e^x} dx =$

A. $e^{x} - \dfrac{1}{3e^{3x}} + c$

B. $e^{x} + \dfrac{1}{3e^{3x}} + c$

C. $e^{-x} - \dfrac{1}{3e^{3x}} + c$

D. $e^{-x} + \dfrac{1}{3e^{3x}} + c$

Answer: A

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9. $\int (1 - x)^{-2} dx =$

A. $(1 - x)^{-1} + c$

B. $(1 + x)^{-1} + c$

C. $(1 - x)^{-1} - 1 + c$

D. $(1 - x)^{-1} + 1 + c$

Answer: B

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10. $\int \frac{\left(x^3 + 3x^2 + 3x + 1\right)}{(x + 1)^5} dx =$

A. $\frac{-1}{x + 1} + c$

B. $\left(\frac{-1}{x + 1}\right)^5 + c$

C. $\log(x + 1) + c$

D. $5\log(x + 5) + c$

Answer: A

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PART-1 INTEGRATION (FILL IN THE BLANK)

1. $\int \frac{1}{x} dx = ...\ + c$

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2. $\int \frac{1}{x^2 - a^2} dx = ...\ + c$

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3. $\int (7x + 9)^{13} dx = ...\ + c$

Watch Video Solution

4. $\int e^{4x-3}dx = \ldots\ldots\ldots\ldots\ldots\ldots\ldots + c$

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5. $\int 5^{6x+9}dx = \ldots\ldots\ldots\ldots\ldots\ldots\ldots . + c$

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6. $\int \frac{5\left(x^6+1\right)}{x^2+1} = \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots + c$

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7. $\int \frac{x^2 + x - 6}{(x - 2)(x - 1)} dx = x + \ldots\ldots\ldots\ldots\ldots\ldots + c$

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8. $If f'(x) = \frac{1}{x} + x$ and $f(1) = \frac{5}{2}$ then $f(x) = \log x + \frac{x^2}{2} + \ldots\ldots\ldots\ldots\ldots + c$

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9. To find the value of $\int \frac{1 + \log x}{x} dx$, the proper substitution is

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10. $\int \frac{1}{x^3}\left[\log x^x\right]^2 dx = p(\log x)^3 + c$ Then p = ...

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PART-1 INTEGRATION (TRUE OR FALSE)

1. The proper substitution for $\int x\left(x^x\right)^x(2\log x + 1)dx is \left(x^x\right)^x = 1$

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2. If $\int xe^{2x}$is equal to $e^{2x}f(x) + c$ where C is constant of integration then $f(x) is \frac{(2x - 1)}{2}$

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3. If $\int xf(x)dx = \frac{f(x)}{2}$ then $f(x) = e^{x^2}$

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4. If $\int \frac{(x-1)dx}{(x+1)(x-2)} = A\log|x+1| + B\log|x-2|$ then $A + B = 1$

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5. For $\int \frac{x-1}{(x+1)^3} e^x dx = e^x f(x) + c$, $f(x) = (x+1)^2$.

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6. If $f'(x) = 3x^2 + 2x$ then by definition of Integration, we get $f(x) = x^3 + x^2 + c$

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7. If $f(x) = k$, where k is constant then $\int k dx = 0$

Watch Video Solution

8. $\int 3^{2x+3} dx = \frac{3^{2x+3}}{2} + c$

Watch Video Solution

9. $\int e^{4x-7}dx = \frac{e^{4x-7}}{-7} + c$

Watch Video Solution

10. $\int \sqrt{1+x^2}.\,xdx = \frac{1}{3}\left(1+x^2\right)^{\frac{3}{2}} + c$

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PART-1 INTEGRATION (3 MARKS EACH)

1. $\int \left(3x^2 - 5\right)^2 dx =$

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2. Evaluate: $\int \frac{1}{x(x-1)} dx$

Watch Video Solution

3. Evaluate

$\int \frac{1}{x \log x} dx$

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4. $\int \frac{2e^x + 5}{2e^x + 1} dx =$

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5. v37

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6. Evaluate: $\int e^x\left(\frac{1}{x} - \frac{1}{x^2}\right)dx$.

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7. Evaluate: $\int \frac{2x + 1}{(x + 1)(x - 2)} dx$

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8. Evaluate $\int x\log x dx$.

Watch Video Solution

9. Evaluate

$\int x^2 e^{4x} dx$

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10. $\int \frac{dx}{\sqrt{3x^2 + 8}} =$

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PART-1 INTEGRATION (4 MARKS EACH)

1. Evaluate: $\int \frac{e^{x}}{(x+1)^2} dx$

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2. Evaluate

$\int xe^{x^2} dx$

Watch Video Solution

3. Evaluate : $\int \frac{x}{(x-1)^2(x+2)} dx.$

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4. Evaluate: $\int \frac{\log x}{(1 + \log x)^2} dx$

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5. $\frac{1}{\sqrt{x^2 - 8x - 20}}$

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6. Evaluate

$\int \frac{1}{4x^2 + 20x + 17} dx$

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7. Evaluate

$$\int \frac{1+x}{x+e^{-x}}dx$$

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8. Evaluate

$$\int \frac{x^3}{\sqrt{1+x^4}}dx$$

Watch Video Solution

9. $\int \frac{3e^{2x}+5}{4e^{2x}-5}dx =$

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10. Evaluate

If $f'(x) = 4x^3 - 3x^2 + 2x + k$, $f(0) = 1$ and $f(1) = 4$ find f (x)

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PART-1 DEFINITE INTEGRATION (CHOOSE THE CORRECT ALTERNATIVE)

1. $\int_2^3 x^4 dx =$

A. $\frac{1}{2}$

B. $\frac{5}{2}$

C. $\frac{5}{211}$

D. $\frac{211}{5}$

Answer: D

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2. $\int_0^a 3x^2 dx = 8$ then `a =

A. 2

B. 0

C. $\frac{8}{3}$

D. a

Answer: A

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3. $\int_4^9 \frac{dx}{\sqrt{x}} =$

A. 4

B. 9

C. 2

D. 0

Answer: C

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4. $\int_0^3 e^x dx =$

A. e^3 - 1

B. $1 - e^3$

C. $e - 1$

D. $1 - e$

Answer: A

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5. $\int_{-2}^{3} \frac{1}{x + 5} dx =$

A. $\log\left(\frac{3}{8}\right)$

B. $\log\left(\frac{8}{3}\right)$

C. $\log\left(\frac{8}{5}\right)$

D. 0

Answer: B

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6. $\int_2^3 \frac{x}{x^2 - 1} dx =$

A. $\log\left(\frac{8}{3}\right)$

B. $-\log\left(\frac{8}{3}\right)$

C. $\frac{1}{2}\log\left(\frac{8}{3}\right)$

D. $-\frac{1}{2}\log\left(\frac{8}{3}\right)$

Answer: C

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7. $\int_a^b f(x)dx =$

A. $\int_b^a f(x)dx$

B. $-\int_a^b f(x)dx$

C. $-\int_b^a f(x)dx$

D. $\int_0^a f(x)dx$

Answer: C

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8. $\int_2^7 \frac{\sqrt{x}}{\sqrt{x} + \sqrt{9 - x}} dx =$

A. $\frac{7}{2}$

B. $\frac{5}{2}$

C. 7

D. 2

Answer: B

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9. $\int_{-9}^{9} \frac{x^3}{4 - x^2} dx =$

A. 0

B. 3

C. 9

D. -9

Answer: A

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PART-1 DEFINITE INTEGRATION (FILL IN THE BLANK)

1. $\int_1^2 x^2 dx = \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots .$

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2. $\int_0^a 4x^3 dx = 81$ then $a =$ ....

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3. $\int_0^1 e^{2x} dx =$ ....

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4. $\int_1^2 \frac{1}{2x+3} dx =$ ....

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5. $\int_2^4 \frac{x}{x^2+1} dx =$ ....

Watch Video Solution

6. $\int_{-7}^{7} \frac{x^3}{x^2 + 7} dx = \ldots\ldots\ldots\ldots\ldots$

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PART-1 DEFINITE INTEGRATION (TRUE OR FALSE)

1. $\int_0^a 3x^2 dx = 27$ then $a = 2.5$. True or False.

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2. $\int_0^1 \frac{1}{2x + 5} dx = \log\left(\frac{7}{5}\right)$

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3. $\int_2^3 \frac{x}{x^2+1} dx = \frac{1}{2}\log 2$. True or False.

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4. $\int_a^b f(x)dx = \int_a^b f(a+b-x)dx$

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5. $\int_0^{2a} f(x)dx = \int_0^a f(x)dx + \int_0^a f(2a-x)dx$

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6. $\int_{-5}^{5} \frac{x}{x^2+7} dx = 10$. True or False.

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PART-1 DEFINITE INTEGRATION (3 MARKS)

1. Evaluate

$$\int_0^1 \frac{x^2+3x+2}{\sqrt{x}} dx$$

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2. Evaluate

$$\int_0^1 \frac{1}{\left(\sqrt{1+x}+\sqrt{x}\right)dx}$$

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3. Evaluate

$\int_0^a (2x+1)dx = 2,$ find a .

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4. Evaluate

$\int_1^a \left(3x^2+2x+1\right)dx = 11,$ find the real valur of a.

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5. Evaluate

$$\int_1^e \frac{dx}{x(1+\log x)^2} dx$$

Watch Video Solution

6. Evaluate

$$\int_1^2 \frac{1}{x^2+4x+3} dx$$

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7. $\int_1^2 \frac{3x}{9x^2-1} dx$

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8. Evaluate the following :

$$\int_1^3 \frac{\sqrt[3]{x+5}}{\sqrt[3]{x+5}+\sqrt[3]{9-x}}dx.$$

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9. Evaluate

$$\int_1^2 \frac{\sqrt{x}}{\sqrt{3-x}+\sqrt{x}}dx$$

Watch Video Solution

10. Evaluate : $\int_0^1 \log\left(\frac{1}{x}-1\right)dx$

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PART-1 DEFINITE INTEGRATION (4 MARKS)

1. Evaluate

$$\int_2^3 \frac{x}{(x+2)(x+3)}dx$$

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2. $\int_1^2 \left(\frac{1}{x} - \frac{1}{2x^2}\right)e^{2x}$ dx is equal to

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3. Evaluate

$$\int_1^3 \log x dx$$

Watch Video Solution

4. Evaluate

$$\int_1^3 x^2 . \log x dx$$

Watch Video Solution

5. Evaluate

$$\int_0^1 e^{x^2} . x^3 dx$$

Watch Video Solution

6. Evaluate

$\int_0^a x^2(a - x)^{3/2}dx$

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7. Evaluate : $\int_0^1 x(1 - x)^5 dx$

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PART-1 DEFINITE INTEGRATION (ACTIVITY)

1. Completing the following activity, Evaluate $\int_1^2 \frac{x + 3}{x(x + 2)}dx$

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2. By completing the following activity, Evaluate

$$\int_2^5 \frac{\sqrt{x}}{\sqrt{x} + \sqrt{7 - x}} dx$$

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PART-1 APPLICATIONS OF DEFINITE INTEGRATION

1. Area of the region bounded by the curve ?

$y = x^3, x = 1, x = 4$ and the X- axis is

A. $\frac{255}{4}$sq. units .

B. $\frac{256}{4}$ sq. units

C. $\frac{255}{3}sq.$ units

D. $\frac{256}{3}$ sq. units

Answer: A

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2. Using the definite integration area of the circle with radius 4 unit is_____

A. 5π sq . Untis

B. 4sq. Units

C. 16 sq. units

D. $16\pi sq$. units

Answer: D

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3. Area of the region bounded by the curve ?$x = y^2$, the positive Y axis and the lines y = 1 & y = 3 is_______

A. 26 sq.units

B. 3 sq.units

C. $\frac{3}{26}$ sq.units

D. $\frac{26}{3}$ sq.units

Answer: D

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4. Area of the region bounded by the curve ?$x^2 = 8y,$ the positive X axis and the lines x= 4 and x= 8 is _______

A. $\frac{76\sqrt{2}}{3}$ sq. units

B. $\frac{76\sqrt{2}}{2}$ se. units

C. $\frac{38\sqrt{2}}{3}$ sq. units

D. $76\sqrt{2}$ sq. units

Answer: A

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5. Area of the region bounded by ? $y^2 = 16x, x = 1$ and $x = 4$ and the X axis, lying in the first quadrant is _____

A. $\frac{56}{3}$ sq.units

B. $\frac{3}{56}$ sq.units

C. 56 sq.units

D. 63 sq.units

Answer: A

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6. Area of the region bounded by $x = y^4, y = 1$ and $y = 5$ and the Y axis lying in the first quadrant is ____

A. $\frac{3124}{5}$ sq. units

B. $\frac{3142}{5}$ sq. units

C. $\frac{3124}{3}$ sq. units

D. $\frac{3142}{3}$ sq. units

Answer: A

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7. Find the area of the region bounded by the parabola $y^2 = 25x$ and the line x =5

A. $\frac{75\sqrt{5}}{2}$ sq. units

B. $\frac{20\sqrt{5}}{3}$ sq. units

C. $\frac{100\sqrt{5}}{3}$ sq. units

D. $\frac{75\sqrt{5}}{3}$ sq. units

Answer: C

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PART-1 APPLICATIONS OF DEFINITE INTEGRATION (TRUE OR FALSE)

1. $y^2 = 4ax$ is the standard form of parabola when curve lies on X axis.

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2. Standard form of parabola is $x^2 = -4by$, when curve lies in the positive Y axis.

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3. The area of portion lying below the X axis is negative.

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4. The area bounded by the curve $y = f(x)$ lies on the both sides of the X -axis is $\left|\int_a^b f(x)dx\right| + \left|\int_b^{©} f(x)dx\right|$.

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5. The area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is

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6. The equation of the area of the ellipse is $x^2 + y^2 = a^2$.

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7. The area of the shaded region bounded by two curves $y = f(x)$, and $y = g(x)$ and X-axis is $\left|\int_a^b f(x)dx + \int_a^b g(x)dx\right|$.

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PART-1 APPLICATIONS OF DEFINITE INTEGRATION (FILL IN THE BLANKS)

1. The area bounded by the parabola $x^2 = 9y$ and the lines $y = 4$ and $y = 9$ in the first quadratint is ____________

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2. The area of the circle $x^2 + y^2 = 16$Using Integration ____________

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3. Find the area of the region bounded by the parabola $y^2 = 4x$, the x-axis, and the lines x = 1 and x = 4.

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4. The area of the region lying in the first quadrant and bounded by the curve $y = 4x^2$, and the lines `y =2 and y =4 is "__________"

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5. The area of the region bounded by the curve $y^2 = x$ and the Y axis in the first quadrant and lines $y = 3$ and $y = 9$ is _ _ _ _ _

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6. The area of the region $x^2 = 4y, y = 1$ and $y = 2$ and the Y axis lying in the first quadrant is_____

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7. The area of the region bounded by $y^2 = 25x, x = 1$ and $x = 2$ and the X axis is ______

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PART-1 APPLICATIONS OF DEFINITE INTEGRATION (3 MARKS)

1. Find the area of the region bounded by the parabola $y^2 = 25x$ and the line x =5

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2. Find the area of the region bounded by the curve $y = \sqrt{9 - x^2}$, X-axis and line $x = 0$ and $x = 3.$

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3. Find the area of the region bounded by the curve $y = \sqrt{2x + 3}$, the X axis and the lines $x = 0$ and $x = 2.$

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4. Find the area of the region bounded by the curve $4y = 7x + 9$, the X-axis and the lines $x = 2$ and $x = 8$.

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5. Find the area of the region bounded by the curve $y = \left(x^2 + 2\right)^2$, the X-axis and the lines $x = 1$ and $x = 3$.

Watch Video Solution

6. Find area of the region bounded by $2x + 4y = 10, y = 2$ and $y = 4$ and the Y- axis lying in the first quadrant.

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7. Find area of the region bounded by the curve y= −4x, the x-axis and the lines x = −1 and x = -2.

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8. Find area of the region bounded by the parabola $x^2 = 36y, y = 1$ and $y = 4,$ and the positive Y-axis.

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9. Find area of the region bounded by the parabola $x^2 = 4y,$ the Y-axis lying in the first quadrant and the lines $y = 3.$

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10. Find the area of the region bounded by the curve $x = \sqrt{25 - y^2}$, the Y- axis lying in the first quadrant and the lines $y = 0$ and $y = 5$.

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11. Find the area of the region bounded by the curve $y = \sqrt{36 - x^2}$, the X- axis lying in the first quadrant and the lines X= 0, X = 6 ?

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PART-1 APPLICATIONS OF DEFINITE INTEGRATION (4 MARKS)

1. Find area of the ellipse $\frac{x^2}{5^2} + \frac{y^2}{4^2} = 1$.

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2. Find the area of the circle $x^2 + y^2 = 6^2$?

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3. Find the area between the parabolas $y^2 = 5x$ and $x^2 = 5y$.

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4. Find the area of the circle $x^2 + y^2 = 16$

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5. Find area of the ellipse $4x^2 + 9y^2 = 36$.

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PART -1 DIFFERENTIAL EQUATIONS AND APPLICATIONS

1. Solution of the equation $x\dfrac{dy}{dx} = y\log y$ is

A. $y = ae^x$

B. $y = be^{2x}$

C. $y = be^{-2x}$

D. $y = e^{ax}$

Answer: D

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2. Bacteria increases at the rate proportional to the number of bacteria present. If the original number N doubles in 3 hours, find in how many hours the number of bacteria will by 4N ?

A. 4 hours

B. 6 hours

C. 8 hours

D. 10 hours

Answer: B

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3. The integrating factor of $\frac{dy}{dx} + y = e^{-x} is$

A. x

B. $-x$

C. e^{x}

D. $y = e^{-x}$

Answer: C

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4. The integrating factor of $\frac{d^2y}{dx^2} - y = e^x$ is e^{-x} then its solution is

A. $yr^{-x} = x + c$

B. $ye^x = x + c$

C. $ye^x = 2x + c$

D. $ye^{-x} = 2x + c$

Answer: A

Watch Video Solution

5. Differential equation of the function $y = \frac{4}{x}$ is

A. $xy + \frac{dy}{dx} = 0$

B. $x\frac{dy}{dx} + y = 0$

C. $\frac{dy}{dx} - 4xy = 0$

D. $x\frac{dy}{dx} + 1 = 0$

Answer: B

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6. General solution of $y - x\frac{dy}{dx} = 0$

A. $3\log x + \frac{7}{y} = c$

B. $2\log gx + \frac{3}{y} = c$

C. $\log x - \log y = \log c$

D. $3\log y + \frac{2}{x} = c$

Answer: C

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7. The order and degree of $\left(\frac{dy}{dx}\right)^3 - \frac{d^3y}{dx^3} + ye^x$ is

A. 3, 1

B. 1, 3

C. 3, 3

D. 1, 1

Answer: A

Watch Video Solution

8. The order and degree of $\left(1+\left(\frac{dy}{dx}\right)^3\right)^{\frac{2}{3}}=8\frac{d^3y}{dx^3}$ are respectively

A. $3, 1$

B. $1, 3$

C. $3, 3$

D. $1, 1$

Answer: C

Watch Video Solution

Watch Video Solution

9. The solution of $\frac{dy}{dx} = 1$ is

A. $x + y = c$

B. $xy = c$

C. $x^2 + y^2 = c$

D. $y - x = c$

Answer: D

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10. The solution of $\frac{dy}{dx} + \frac{x^2}{y^2} = 0$ is

A. $x^3 + y^3 = 7$

B. $x^2 + y^2 = c$

C. $x^3 + y^3 = c$

D. $x + y = c$

Answer: C

Watch Video Solution

PART -1 DIFFERENTIAL EQUATIONS AND APPLICATIONS (FILL IN THE BLANKS)

1. Order of highest derivative occurring in the differential equation is called the .... of the differential equation.

Watch Video Solution

2. A solution of differential equation which can be obtained from the general solution of differential equation is called ....Solution.

Watch Video Solution

3. Order and degree of differential equation are always ....integers

Watch Video Solution

4. The power of higher ordered derivative when all the derivatives are made free from negative and / or fractional indices if any is called .... of the differential equation.

Watch Video Solution

5. The integrating factor of the differential equation $\frac{dy}{dx} - y = x$ is ....

Watch Video Solution

6. The solution of $\frac{dy}{dx} + y = 3$ is...............

Watch Video Solution

Watch Video Solution

7. Integrating factor of $\frac{dy}{dx} + \frac{y}{x} = x^3 - 3$ is

Watch Video Solution

8. Order and degree of differential equation $\left(\frac{d^3y}{dx^3}\right)^{\frac{1}{6}} = 9$ is ....

Watch Video Solution

9. The function $y = e^x$ is solution .... of differential equation

Watch Video Solution

10. The solution of differential equation $x^2 \frac{d^2y}{dx^2} = 1$ is

....

Watch Video Solution

PART -1 DIFFERENTIAL EQUATIONS AND APPLICATIONS (TRUE OR FALSE)

1. The integrating factor of the differential equation $\frac{dy}{dx} - y = x$ is e^{-x}

Watch Video Solution

2. Order and degree of differential equation are always Positive integers

Watch Video Solution

3. The degree of a differential equation is the power of higher ordered derivative when all the derivatives are made free form negative and / or fractional indices if any.

Watch Video Solution

4. Order of highest derivative occurring in the differential equation is called the degree of the differential equation

Watch Video Solution

5. The degree of a differential equation $e^{-\frac{dy}{dx}} = \frac{dy}{dx} + c$ is not defined

Watch Video Solution

6. A homogeneous differential equation is solved by substituting = ?? and integrating it.

Watch Video Solution

7. Order and degree of differential equation $x\frac{d^3y}{dx^3} + 6\left(\frac{d^2y}{dx^2}\right)^2 + y = 0 is (2, 2)$

Watch Video Solution

8. Number of arbitrary constant in the general solution of a differential equation is equal to order of D.E.

Watch Video Solution

9. A differential equation in which the dependent variable ,say y, depends only on one dependent variable , say x, is called as ordinary differential equation

Watch Video Solution

10. The function $y = cx$ is the solution of differential equation

$$\frac{dy}{dx} = \frac{y}{x}$$

Watch Video Solution

PART -1 DIFFERENTIAL EQUATIONS AND APPLICATIONS (3 MARKS)

1. Solve the differential equation $\frac{dy}{dx} + y = e^{-x}$

Watch Video Solution

2. Solve the differential equation $x\frac{dy}{dx} + 2y = x^2 \log x$

Watch Video Solution

3. Solution of the differential equation $\frac{dy}{dx} = \frac{x+y+1}{x+y-1}, y = \frac{1}{3}, x = \frac{2}{3}$, is

Watch Video Solution

4. Solve the differential equation $xdx + 2ydy = 0$

Watch Video Solution

5. Solve the differential equation $\left(x^2 - yx^2\right)dy + \left(y^2 + xy^2\right)dx = 0$

Watch Video Solution

6. Solve the following differential equation $\frac{dy}{dx} = x^2y + y$

Watch Video Solution

7. Find the differential equation by eliminating arbitrary constants from the relation $x^2 + y^2 = 2ax$

Watch Video Solution

8. Find the differential equation by eliminating arbitrary constants from the relation $y = \left(c_1 + c_2x\right)e^x$

Watch Video Solution

9. $y = \log x + c$ is a solution of the differential equation $x\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$

Watch Video Solution

10. Solve : $\frac{dy}{dx} + \frac{2}{x}y = x^2$

Watch Video Solution

PART -1 DIFFERENTIAL EQUATIONS AND APPLICATIONS (4 MARKS)

1. Find particular solutions of the following differential equations :

(1) $\left(x - y^2x\right)dx - \left(y = x^2y\right)dy = 0, \text{ when } x = 2, y = 0$

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2. Solution of the differential equation $\frac{dy}{dx} + \frac{x - 2y}{2x - y} = 0$ is

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3. Find the differential equation from the relation $x^2 + 4y^2 = 4b^2$

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4. The population of a town increases at a rate proportional to the population at that time . If the population increases from 40 thousands to 60 thousands in 40 years, What will be the population in another 20 years ? = [Given: $\sqrt{\frac{3}{2}} = 1.2247$]

Watch Video Solution

5. The rate o growth of bacteria is proportional to the number present . IT intially, there were 1000 bacteria and the number doubles in 1 hours. Find the number of bacteria after $2\frac{1}{2}$ hours . [take $\sqrt{2} = 1.414$]

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6. Solve the following differential equation

$$yx\frac{dy}{dx} = x^2 + 2y^2$$

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7. Solve the following differential equation

$$y\log y\frac{dx}{dy} = \log y - x$$

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8. For the differential equation, find the particular solution

$$\frac{dy}{dx} = (4x + y + 1), \text{ when } y = 1, x = 0$$

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9. Solve the following differential equation $y^2dx + \left(xy + x^2\right)dy = 0$

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10. Solve the following differential equations : (1) $x^2\frac{dy}{dx} = x^2 + xy + y^2$

Watch Video Solution

PART -1 DIFFERENTIAL EQUATIONS AND APPLICATIONS (ACTIVITY)

1. The fourth term in an arithmetic sequence is -20, and the eighth term is -10. What is the hundredth term in the sequence?

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2. Verify $y = \frac{a}{x} + b$ is solution of $x\frac{d^2y}{dx^2} + 2\frac{dy}{dx} = 0$

Watch Video Solution

3. The rate of growth of a population is proportional to the number present if the population of a city doubled in the past 25 years, and the present population is 100000, when will the city have a population of 500000?

Watch Video Solution

4. In a certain culture of bacteria, the rate of increase is proportional to the number present. If it is found that the number doubles in 4 hours, find the number of times the bacteria are increased in 12 hours.

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5. Find the population of city at any time t given that rate of increase of population is proportional to the population at that instant & that period of 40 years the population increased from 30000 to 40000.

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6. Solve

$\sec^2 x \tan y dx + \sec^2 y \tan x dy = 0.$

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7. Solve the following differential equation

$\frac{dy}{dx} = \cos(x + y)$

Watch Video Solution

8. $\frac{dy}{dx} = e^{2y}\cos x, \quad \text{when } x = \frac{\pi}{6}, y = 0$

Watch Video Solution

9. Bacteria increases at the rate proportional to the number of bacteria present. If the original number N doubles in 3 hours, find in how many hours the number of bacteria will by 4N ?

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10. The population of city doubles in 80 years , in how many year will it be triple when the rate of increase is proportional to the number of inhabitants.

Watch Video Solution

Part II (1. Commission, Brokerage and Discount (Commerce 88)) (I Choose the correct alternative)

1. A salesman receives 3% commission on the sales up to Rs. 50,000 and 4% commission on the sales over Rs. 50,000. His total income on the sale of Rs. 2,00,000 is ___________

A. Rs. 6,000

B. Rs. 7,550

C. Rs. 7,500

D. Rs. 1,500

Answer: B

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2. The present worth of Rs.11,660 due 9 months hence is Rs.11,000.The True discount is ______

A. Rs. 660

B. Rs. 750

C. Rs. 400

D. Rs. 5,940

Answer: A

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3. If A bill of Rs.6,395 drawn on 15th February 2015 for 10 months was discounted on 28th May 2015 at 8% p.a. interest then legal due date is _____

A. 15th December 2015

B. 15th November 2015

C. 18th December 2015

D. 18th November 2015

Answer: C

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4. The date on which the period of the bill expires is called ______

A. Legal Due Date

B. Days of grace

C. The Nominal Due date

D. Date of Drawing

Answer: C

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5. The marked price is also called as ______

A. Cost price

B. Selling price

C. Invoice price

D. List price

Answer: D

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Part II (1. Commission, Brokerage and Discount (Commerce 88)) (II Fill in the blanks.)

1. An agent who gives guarantee to his principal that the party will pay the sale price of goods is called __________

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2. The difference between the _______________ and the true discount is called Banker's Gain (B.G). It is equal to the interest on true discount.

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3. The buyer is legally allowed _______ days grace period

Watch Video Solution

4. The date on which the bill is drawn is called as _______

Watch Video Solution

5. When transactions like sale, purchase, auction etc. are done through some middlemen, such middlemen are called _______

Watch Video Solution

Part II (1. Commission, Brokerage and Discount (Commerce 88)) (III) State whether each of the following is True or False.)

1. The trade discount is first calculated on the catalogue (list) price.(True/False)

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2. State True or False: A factor is an agent who is given the possession of goods and enters a contract for sale in his/her own name.

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3. State true or false: A person can get both, trade discount and cash discount.

Watch Video Solution

4. State True or False: The sum due is also called as Cash value

Watch Video Solution

5. If only one discount is given then

A. List price = Invoice price.

B. Invoice price = Net selling price.

C. List price = Cost price.

D. Cost price = Net selling price.

Answer: B

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Part II (1. Commission, Brokerage and Discount (Commerce 88)) (IV) Solve the following problems.

1. Find the true discount, Banker's discount and Banker's gain on a bill of Rs.4,240 due 6 months hence at 9% p.a.

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2. Ananya gets salary of Rs. 15,000 per month and commission at 8% on the sales over Rs.50,000. If she gets Rs. 17,400 in a certain month, Find the sales made by her in that month.

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3. Swastik Distributers allows 15% discount on the list price of washing machine. Further 5% discount is given for cash payment.Find the list price of the washing machine if it was sold for the net amount of Rs. 38,356.25.

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4. An agent sold a car and charged 3% commission on sale value. If the owner of the car received Rs.48,500, find the sale value of the car. If the agent charged 2% from the buyer, find his total remuneration.

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5. A bill of Rs.65,700 drawn on July 10 for 6 months was discounted for Rs.65,160 at 5% p.a. on what day was the bill discounted?

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Part II (1. Commission, Brokerage and Discount (Commerce 88)) (V) Solve the following problems.

1. A bill was drawn on 14th April for Rs.7,000 and was discounted on 6th July at 5% p.a. The Banker paid Rs.6,930 for the bill. What is the legal due date.

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2. A bill of Rs.51,000 was drawn on 18th February 2010 for 9 months. It was encashed on 28th June 2010 at 5% p.a. Calculate the banker's gain and true discount.

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3. A retailer sold a suit for Rs.8,832 after allowing 8% discount on marked price and further 4% cash discount. If he made 38% profit, find the cost price and the marked price of the suit.

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4. If difference between true discount and banker's discount on a sum due 4 months hence is Rs 20. Find true discount, banker's discount and amount of bill, the rate of simple interest charged being 5%p.a.

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Part II (1. Commission, Brokerage and Discount (Commerce 88)) (VI) Activity

1. A bill of Rs.8,000 drawn on 5th January 2019 for 8 months was discounted for Rs.7,680 on a certain date. Find the date on which it was discounted at 10% p.a.

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2. Three cars were sold through an agent for Rs.2,40,000 , Rs.2,22,000 and Rs.2,25,000 respectively. The rates of commission were 17.5% on the first, 12.5% on the second. If the agent overall received 14% commission on the total sales, find the rate of commission paid on the third car.

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Part II 2. Insurance and Annuity (Multiple choice questions:)

1. Rental payment for an apartment is an example of

A. Annuity due

B. Perpetuity

C. Ordinary annuity

D. Installment

Answer: B

Watch Video Solution

2. In an ordinary annuity, payments or receipts occur at

A. Beginning of each period

B. End of each period

C. Mid of each period

D. Quarterly basis

Answer: B

Watch Video Solution

3. The amount which can be demanded under the policy is ______.

A. policy value

B. premium

C. interest

D. claim

Answer: D

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4. A shop valued $2, 00, 000$ is insured at 80% of it's value.

If the rate of premium is 4%, then the premium is

A. 6400

B. 6000

C. 6450

D. 6500

Answer: A

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5. If the claim under the policy is Rs. 4,000 and ratio of property value to policy value is 5:4 then loss occurred is

A. Rs.4,400

B. Rs.4,000

C. RS.5,000

D. Rs. 5,500

Answer: C

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6. The period for the fire insurance policy is

A. one year

B. two years

C. three years

D. four years

Answer: A

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7. Premium is paid on ------- value.

A. property

B. policy

C. insured

D. both b) and c)

Answer: B

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8. In annuity calculations, the interest is usually taken as

A. simple interest per annum

B. interest compounded every year

C. interest compounded per month

D. simple interest per month

Answer: B

Watch Video Solution

9. If for an immediate annuity r = 10% p.a.,P = Rs. 12,679.46 and A = Rs. 18,564, then the amount of each annuity paid is

A. Rs. 4,000

B. Rs. 4,500

C. Rs. 3,500

D. Rs. 4,200

Answer: A

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10. The present value of an immediate annuity of Rs. 10,000 paid each quarter for four quarters at 16% p.a. compounded quarterly is

A. 40000

B. 36300

C. 36286.75

D. 36289.25

Answer: B

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Part II 2. Insurance and Annuity (True or False)

1. Premium is the amount paid to the insurance company every month.

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2. State True or False: An installment of money paid for insurance is called Premium

Watch Video Solution

3. State True or False: The value of insured property is called policy value

Watch Video Solution

4. State True or False: A sinking fund is a fund established by financial organization

Watch Video Solution

5. State True or False: The relation between accumulated value 'A'and present value 'P' is $A = P(1 + i)^n$

Watch Video Solution

6. State True or False: The future value of an annuity is the accumulated values of all instalments

Watch Video Solution

7. State true or false : Annuity contingent begins and ends on certain fixed dates

Watch Video Solution

Part II 2. Insurance and Annuity (Fill in the blanks:)

1. State True or False: An annuity where payments continue forever is called perpetuity.

Watch Video Solution

2. In an ordinary annuity, payments or receipts occur at_____

Watch Video Solution

3. The present value of an immediate annuity for4 years at 10% p.a. compounded annually isRs. 23,400. It's accumulated value after 4 years would be ______.

Watch Video Solution

4. If for an immediate annuity $r = 10\%$ p.a., $P = 12,679.46$ and $A = 18,564$ then the amount of each annuity paid is_____

Watch Video Solution

5. An annuity in which each payment is made at the end of period is called ______

Watch Video Solution

6. If payments of an annuity fall due at the beginning of every period, the series is called annuity ________.

Watch Video Solution

7. The intervening time between payment of two successive installments is called as ________.

Watch Video Solution

8. _______ insurance is not covered by general insurance.

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Part II 2. Insurance and Annuity (3. marks Questions:)

1. A shop and a godown worth Rs.1,00,000 and Rs.2,00,000 respectively were insured through an agent who was paid 12% of the total premium. If the shop was insured for 80% and the godown for 60% of their respective values, find the agent's commission, given that the rate of premium was 0.80% less 20% .

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2. The rate of premium is 2% and other expenses are 0.075%. A cargo worth Rs.3,50,100 is to be insured so that all its value and the cost of insurance will be recovered in the event of total loss.

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3. A merchant takes fire insurance policy to cover 80 % of the value of his stock. Stock worth Rs.80,000 was completely destroyed in a fire. while the rest of stock was reduced to 20% of its value. If the proportional compensation under the policy was Rs.67,200, find the value of the stock.

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4. The rate of premium is 2% and other expenses are 0.075%. A cargo worth Rs.3,50,100 is to be insured so that all its value and the cost of insurance will be recovered in the event of total loss.

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5. A 35-year old person takes a policy for Rs.1,00,000 for a period of 20 years. The rate of premium is Rs.76 and the average rate of bonus is Rs.7 per thousand p.a. If he dies after paying 10 annual premiums, what amount will his nominee receive?

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6. A person invested Rs.5,000 every year in finance company that offered him interest compounded at 10% p.a., what is the amount accumulated after 4 years? [Given$(1.1)^4 = 1.4641$]

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7. Find the amount of an ordinary annuity if a payment of Rs. 500 is made at the end of every quarter for 5 years at the rate of 12% per annum compounded quarterly.

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8. An annuity immediate is to be paid for some years at 12% p.a. The present value of the annuity is Rs.10,000 and the accumulated value is Rs.20,000. Find the amount of each annuity payment.

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9. A person sets up a sinking fund in order to have Rs.1,00,000 after 10 years. What amount should be deposited biannually in the account that pays him 5% p.a. compounded semiannually?[Given $(1.025)^{20} = 1.675$]

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10. A company decides to set aside a certain sum at the end of each year to create a sinking fund, which should amount to Rs. 4 lakhs in 4 years at 10% p.a. Find the amount to be set aside each year?

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Part II 2. Insurance and Annuity (Activity based Question)

1. Find the premium on property worth Rs.12,50,000 at 3% when the property is fully insured

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2. Find the premium on property worth Rs.12,50,000 at 3% when the property is insured to the extent of 80% of its value

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3. Fill in the squares given

The future amount A = Rs. 10,00,000 ,Period (n) = 20 , $r = 5\,\%$

$$A = \frac{C}{i}\left[(1+i)^n - 1\right]$$

$i = \dfrac{r}{200}$ as interest is calculated semi-annually

$$A = 10,00,000 = \frac{C}{i}\left[(1+i)^n - 1\right]$$

$$10,00,000 = \frac{C}{0.025}[(1+0.025))^{\square} - 1\Big]$$

$$= \frac{C}{0.025}[2.685 - 1]$$

$$10, 00, 000 = \frac{C \times 1.685}{0.025}$$

$C = \Box$

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Part II 3. LINEAR REGRESSION (I Select and write the most appropriate answer from given alternatives of the following sub questions:)

1. If for a bivariate data, $b_{yx} = -1.2$ and $b_{xy} = -0.3$ then r =

A. -0.06

B. 0.06

C. 0.6

D. -0.6

Answer: D

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2. If the regression equation x on y is $3x + 2y = 26$ then b_{xy} equals to

A. 3/2

B. 2/3

C. -3/2

D. -2/3

Answer: D

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3. If $b_{yx} < 0$ and $b_{xy} < 0$ then r is _____

A. $a < 0$

B. $b > 0$

C. $c = 0$

D. $d > 1$

Answer: A

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4. $\left|b_{xy} + b_{yx}\right| \geq$ ________

A. $|r|$

B. $2|r|$

C. r

D. $-r$

Answer: B

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5. Find the value of the covariance between x and y, if the regression coefficient of y on x is 3.75 and $\sigma_x = 2, \sigma_y = 8$

A. 7

B. 30

C. 15

D. 1.875

Answer: C

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6. The slope of the line of regression of y on x is called the

______

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7. Regression analysis is the theory of

A. Estimation

B. Prediction

C. Both a and b

D. Calculation

Answer: C

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8. We can estimate the value of one variable with the help of other known variable only if they are

A. Correlated

B. Positively correlated

C. Negatively correlated

D. Uncorrelated

Answer: A

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9. There are ________ types of regression equations.

A. 4

B. 2

C. 3

D. 1

Answer: B

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10. In the regression equation of X on Y

A. X is independent and Y is dependent.

B. Y is independent and X is dependent.

C. Both X and Y are independent.

D. Both X and Y are dependent.

Answer: B

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11. b_{xy} and b_{yx} are ________

A. Independent of change of origin and scale

B. Independent of change of origin but not of scale

C. Independent of change of scale but not of origin

D. Affected by change of origin and scale

Answer: B

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12. If the lines of regression of y on x is $y = \frac{x}{4}$ and x on y is $x = \frac{y}{9} + 1$, then the value of r is

A. $\frac{1}{6}$

B. 0

C. - $\frac{1}{4}$

D. - $\frac{1}{6}$

Answer: A

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13. If r = 0.5, $\sigma_x = 3, \sigma_y^2 = 16$ then b_{yx} =...

A. 0.375

B. 0.667

C. 2.667

D. 0.093

Answer: B

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14. The regression line is obtained by

A. Minimizing the sum of squares of deviations of the predicted values from the observed values.

B. Minimizing the sum of deviations of the predicted values from the observed values.

C. Maximizing the sum of squares deviations of the predicted values from the observed values.

D. Maximizing the sum of deviations of the predicted values from the observed values.

Answer: A

View Text Solution

15. $u = \dfrac{x - 20}{5}$ and $v = \dfrac{y - 30}{4}$, then $b_{xy} =$

A. $\frac{4}{5} b_{vu}$

B. $\frac{4}{5} b_{uv}$

C. $\frac{5}{4} b_{uv}$

D. $\frac{5}{4} b_{vu}$

Answer: C

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16. If $y = 5 - 2.8x$ and $x = 3 - 0.5y$ be the regression lines ,then the value of b_{yx} is

A. -0.5

B. -2.8

C. -0.5

D. -2

Answer: D

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17. If $r = 0.5, \sigma_x = 3, \sigma_y^2 = 16$ then $b_{xy} = ...$

A. 0.375

B. 0.667

C. 2.667

D. 0.093

Answer: A

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Part II 3. LINEAR REGRESSION (II State whether the following statements are true or false:)

1. State True or False: The equations of two regression lines are $10x - 4y = 80$ and $10y - 9x = 40$. then $b_{xy} = 0.9$

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2. State True or False: $y = 5 + 2.8x$ and $x = 3 + 0.5y$ be the regression lines of y on x and x on y respectively ,then $b_{yx} = -0.5$

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3. State true or false: Both the regression coefficients cannot exceed 1

Watch Video Solution

4. State True or False: If $b_{yx} = 1.5$ and $b_{xy} = \frac{1}{3}$ then $r = \frac{1}{2}$. The given data is consistent.

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5. Correlation analysis is the theory of games. (True/False)

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6. State True or False: If $b_{xy} < 0$ and $b_{yx} < 0$ then 'r' is > 0

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7. State True or False: The following data is not consistent: $byx + bxy = 1.3$ and $r = 0.75$

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8. State True or False: If $u = x - a$ and $v = y - b$ then $b_{xy} = b_{uv}$.

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9. State True or False: If equation of regression lines are $3x + 2y - 26 = 0$ and $6x + y - 31 = 0$ then mean of x is 7.

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10. State True or False b_{xy} is the slope of regression line of y on x.

Watch Video Solution

11. State True or False: corr$(x, x) = 0$

Watch Video Solution

12. State True or False: corr$(x, x)=1$

Watch Video Solution

13. State True or False: cov(x, x)= variance of x

Watch Video Solution

14. Regression analysis is used for measuring the degree of the relationship between the variables. (True/False)

Watch Video Solution

15. State True or False: Regression coefficient of x on y is the slope of regression line of x on y

Watch Video Solution

16. The variable used for predicting the response is called the independent variable.

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17. If

$n = 5, \sum x = \sum y = 20, \sum x^2 = \sum y^2 = 90, \sum xy = 76$

Find

Covariance (x,y)

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Part II 3. LINEAR REGRESSION (III. Fill in the following blanks:)

1. $|b_{xy} + b_{yx}| \geq$ ________

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2. Among the given regression lines $6x + y - 31 = 0$ and $3x + 2y - 26 = 0$,the regression line of x on y is..........

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3. If $u = \frac{x - a}{c}$ and $v = \frac{y - b}{d}$ then $b_{xy} =$

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4. If the regression equations are $8x – 10y + 66 = 0$ and $40x – 18y = 214$, the mean value of y is.....

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5. If the sign of the correlation coefficient is negative, then the sign of the slope of the respective regression line is _____

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6. The value of product moment correlation coefficient between x and x is _____

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7. Arithmetic mean of positive values of regression coefficients is greater than or equal to ______

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8. If $u = \frac{x - 20}{5}$ and $v = \frac{y - 30}{4}$ then $b_{yx} =$

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9. The geometric mean of negative regression coefficients is ______

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10. Dependent variables are also known as ______

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11. b_{yx} is the ..... of regression line of y on x

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Part II 3. LINEAR REGRESSION (IV.Answer the following:)

1. The equations of two lines of regression are $3x + 2y - 26 = 0$ and $6x + y - 31 = 0$. find variance of x if variance of y is 36.

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2. Given the following information about the production and demand of acommodity.

Obtain the two regression lines :

	ADVERTISEMNT(x) (₹.in lakhs)	DEMAND(y) (₹ in lakhs)
MEAN	10	90
VARIANCE	9	144

Coefficient of correlation between x and y is 0.8.

What should be the advertising budget if the company wants to attain the sales target of Rs.150 lakhs?

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3. The equations of the two lines of regression are $2x + 3y - 6 = 0$ and $5x + 7y - 12 = 0$

a. Identify the regression lines.

b. Find the value of the correlation coefficient (Given $\sqrt{0.933} = 0.9667$.)

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4. The age in years of 7 young couples is given below. Calculate husband's age when

wife's age is 38 years.

Husband(x)	21	25	26	24	22	30	20
Wife(y)	19	20	24	20	22	24	18

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5. Given the following information about the production and demand of a commodity.

Obtain the two regression lines :

	PRODUCTION(X)	DEMAND(Y)
MEAN	85	90
VARIANCE	25	36

Coefficient of correlation between X and Y is 0.6. Also estimate the demand when the production is 100 units.

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6. The equations of the two lines of regression are $6x + y - 31 = 0$ and $3x + 2y - 26 = 0$.

Identify the regression lines

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7. The equations of the two lines of regression are $6x + y - 31 = 0$ and $3x + 2y - 26 = 0$.

Find the value of the correlation coefficient.

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Watch Video Solution

8. The equations of the two lines of regression are $6x + y - 31 = 0$ and $3x + 2y - 26 = 0$.

Calculate the mean values of x and y.

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9. Two samples from bivariate populations have 15 observations each. The sample means of X and Y are 25 and 18 respectively. The corresponding sum of squares of deviations from means are 136 and 148 respectively. The sum of product of deviations from respective means is 122.Obtain the regression equation of x on y.

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10. For 50 students of a class, the regression equation of marks in Statistics(X) on the marks in accountancy(Y) is $3y - 5x + 180 = 0$.The mean marks in accountancy is 44 and the variance of marks in Statistics is $\left(\frac{9}{16}\right)th$ of variance of marks in Accountancy .Find the mean marks in Statistics and the correlation coefficient between the marks of the two subjects.

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11. If

$n = 5, \sum x = \sum y = 20, \sum x^2 = \sum y^2 = 90, \sum xy = 76$

Find

Covariance (x,y)

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12. If

$n = 5, \sum x = \sum y = 20, \sum x^2 = \sum y^2 = 90, \sum xy = 76$

Find the regression equation of x on y.

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13. If n = 6,

$\sum x = 36, \sum y = 60, \sum xy = -67, \sum x^2 = 50, \sum y^2 = 106,$

Estimate y when x is 13.

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Watch Video Solution

14. Compute the appropriate regression equation for the following data:

x(Dependent Variable)	10	12	13	17	18
y(Independent Variable)	5	6	7	9	13

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15. For a certain bivariate data of a group of 10 students, the following information gives the internal marks obtained in English (X)and Hindi (Y) :

	X	Y
MEAN	13	17
STANDARD DEVIATION	3	2

If $\sum(x-\bar{x})(y-\bar{y}) = 36$, Estimate x when y =16 and y when x=10.

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Part II 3. LINEAR REGRESSION (V. Activity questions:)

1.

X	Y	x-$\bar{x}$	y-$\bar{y}$	(x-$\bar{x}$) (y-$\bar{y}$)	(x-$\bar{x}$)^2	(y-$\bar{y}$)^2
1	5	-2	-4	8	4	16
2	7	-1	-2	$\square$	1	4
3	9	0	0	0	0	0
4	11	1	2	2	4	4
5	13	2	4	8	1	16
Total=15	Total=45	Total=0	Total= 0	Total$\square$	Total=10	Total=40

Mean of $x = \bar{x} = \square$

Mean $y = \bar{y} = \square$

$$b_{xy} = \frac{\square}{\square}$$

$$b_{yx} = \frac{\square}{\square}$$

Regression equation of x on y is $x - \bar{x} = b_{xy}(y - \bar{y})$

$\therefore$ Regression equation of x on y is $\square$

Regression equation of y on x is $y - \bar{y} = b_{yx}(x - \bar{x})$

$\therefore$ Regression equation of y on x is $\square$

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2. Mean of x= 53

Mean of y = 28

Regression coefficient of y on x = - 1.2

Regression coefficient of x on y= - 0.3

$r = \square$

Watch Video Solution

3. Mean of x= 53

Mean of y = 28

Regression coefficient of y on x = - 1.2

Regression coefficient of x on y= - 0.3

When x = 50 ,

$y - \square = \square(50 - \square)$

$\therefore y = \square$

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4. Mean of x= 53

Mean of y = 28

Regression coefficient of y on x = - 1.2

Regression coefficient of x on y= - 0.3

When y = 25

$x - \square = \square(25 - \square)$

$\therefore x = \square$

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5. Mean of x= 25

Mean of y =20

$\sigma_x = 4$

$\sigma_y = 3$

$r = 0.5$

$b_{yx} = \square$

$b_{xy} = \square$

When x = 10

$y - \square = \square(10 - \square)$

$\therefore y = \square$

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6. The regression equation of y on x is 2x-5y +60 =0.

Mean of x = 18

$\therefore \bar{y} = \square$

$\sigma_x : \sigma_y = 3 : 2$

$\therefore b_{yx} = \frac{\square}{\square}$

$\therefore r = \square$

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7. The regression equation of x on y is 40x-18y = 214... (i)

The regression equation of y on x is 8x -10y +66 =0..... (ii)

Solving equations i and ii,

$\bar{x} = \square$

$\bar{y} = \square$

$\therefore b_{yx} = \frac{\square}{\square}$

$\therefore b_{xy} = \frac{\square}{\square}$

$\therefore r = \square$

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8.

X	y	xy	x^2	y^2
6	9	54	36	81
2	11	22	4	121
10	5	50	100	25
4	8	32	16	64
8	7	□	64	49
Total=30	Total=40	Total□	Total= 220	Total□

$$b_{xy} = \frac{\square}{\square}$$

$$b_{yx} = \frac{\square}{\square}$$

$\therefore$ Regression equation of x on y is □

$\therefore$ Regression equation of y on x is □

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Part II 4. TIME SERIES (I) Choose the correct alternative.)

1. Which of the following can’t be a component of a time series?

A. Seasonality

B. Cyclical

C. Trend

D. Mean

Answer: D

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2. Which component of time series refers to erratic time series movements that follow no recognizable or regular pattern?

A. Trend

B. Seasonal

C. Cyclical

D. Irregular

Answer: A

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3. The following trend line equation was developed for annual sales from 1984 to 1990 with 1984 as base or zero year. Y = 500 + 60X (in 1000 ₹). The estimated sales for 1984 (in 1000 Rs) is:

A. 500

B. 560

C. 1040

D. 1100

Answer: A

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4. An overall upward or downward pattern in an annual time series would be contained in which component of the times series

A. Trend

B. Cyclical

C. Irregular

D. Seasonal

Answer: A

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5. Moving averages are useful in identifying

A. Seasonal component

B. Irregular component

C. Trend component

D. cyclical component

Answer: C

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Part II 4. TIME SERIES (II) Fill in the blanks

1. ________ components of time series is indicated by a smooth line.

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2. ________ component of time series is indicated by periodic variation year after year.

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3. The complicated but efficient method of measuring trend of time series is _______

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4. The simplest method of measuring trend of time series is _________

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5. The method of measuring trend of time series using only averages is _____

Watch Video Solution

Part II 4. TIME SERIES (III) State whether each of the following is True or False.)

1. The secular trend component of time series represents irregular variations.(True/False)

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2. Seasonal variation can be observed over several years. (True/False)

Watch Video Solution

3. Cyclical variation can occur several times in a year. (T/F)

Watch Video Solution

4. Moving average method of finding trend is very complicated and involves several calculations.

View Text Solution

5. Least squares method of finding trend is very simple and does not involve any calculations.

View Text Solution

Part II 4. TIME SERIES (IV) Solve the following problems.)

1. Following table shows the amount of sugar production (in lac tons) for the years 1971 to 1982.

Year	1971	1972	1973	1974	1975	1976
Production	1	0	1	2	3	2
Year	1977	1978	1979	1980	1981	1982
Production	4	6	5	1	4	10

Fit a trend line by the method of least squares.

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2. Obtain trend values for data in Problem 1 using 4-yearly centered moving averages.

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3. The following table gives the production of steel (in millions of tons) for years 1976 to 1986.

Year	1976	1977	1978	1979	1980	1981
Production	0	4	4	2	6	8
Year	1982	1983	1984	1985	1986	
Production	5	9	4	10	10	

Fit a trend line by the method of least squares. Also, obtain the trend value for the year 1990.

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4. Obtain the eighth term in the series 2, 6, 18, 54,.........

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5. Use the method of least squares to fit a trend line to the data in Problem 6 below. Also, obtain the trend value for the year 1975.

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6. The following table shows the production of gasoline in U.S.A. for the years 1962 to 1976. Obtain trend values for the above data using 5-yearly moving averages.

Year	1962	1963	1964	1965	1966	1967	1968	1969
Production(million barrels)	0	0	1	1	2	3	4	5
Year	1970	1971	1972	1973	1974	1975	1976	
Production(million barrels)	6	8	9	9	8	9	10	

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Part II 4. TIME SERIES (V) Activity based questions)

1. Following table shows the all India infant mortality rates (per '000) for years 1980 to 2000.

Year	1980	1985	1990	1995
IMR	10	7	5	4
Year	2000	2005	2010	
IMR	3	1	0	

Fit a trend line by the method of least squares.

View Text Solution

2. Which term of the A.P. 3,8,13 ...is 78?

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3. There are 650 students in a school. If the number of girls is 106 more than the boys, how many boys are there in the school?

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4. Complete the table using 4 yearly moving average method

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Part II 5. INDEX NUMBERS (I) Choose the correct alternative.)

1. Price Index Number by using Weighted Aggregate Method is given by

A. $\frac{\sum p_1 q}{\sum p_0 q} \times 100$

B. $\sum p_1 w \times 100$

C. $\frac{\sum p_1 w}{\sum p_o w} \times 100$

D. $\frac{\sum p_0 w}{\sum p_1 w} \times 100$

Answer: C

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2. The formula $p_{01} = \frac{\sum p_1 q_0}{\sum p_0 q_0} \times 100$ is for

A. Laspeyre's Price Index Number

B. Paasche's Price Index Number

C. Fisher's Price Index Number

D. Walsh's Price Index Number

Answer: A

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3. Dorbish Bowley's Price Index Number is

A. $P_{01}(L) + P_{01}(P)$

B. $P_{01}(L) - P_{01}(P)$

C. $\dfrac{P_{01(L)} + P_{01(P)}}{2} \times 100$

D. $\dfrac{P_{01(L)} + P_{01(P)}}{2}$

Answer: D

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4. $\dfrac{\sum p_1 q_1 w}{\sum p_0 q_0 w} \times 100$ gives

A. Value Index Number by Simple Aggregate method

B. Value Index Number by Weighted Aggregate method

C. Cost of Living Index Number

D. Laspeyre's Index Number

Answer: B

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5. Walsh's Price Index Number is given by

A. $\dfrac{\Sigma\left(\dfrac{q_0}{\sqrt{p_0 p_1}}\right)}{\Sigma\left(\dfrac{q_1}{\sqrt{p_0 p_1}}\right)} \times 100$

B. $\dfrac{\Sigma\left(\dfrac{p_0}{\sqrt{q_0 q_1}}\right)}{\Sigma\left(\dfrac{p_1}{\sqrt{q_0 q_1}}\right)} \times 100$

C. $$\frac{\sum\left(\frac{q_1}{\sqrt{p_0 p_1}}\right)}{\sum\left(\frac{q_0}{\sqrt{p_0 p_1}}\right)} \times 100$$

D. $$\frac{\sum\left(\frac{p_1}{\sqrt{q_0 q_1}}\right)}{\sum\left(\frac{p_0}{\sqrt{q_0 q_1}}\right)} \times 100$$

Answer: D

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6. Quantity Index Number by Simple Aggregate Method is given by

A. $\dfrac{\Sigma\left(q_1\right)}{\Sigma\left(q_0\right)} \times 100$

B. $\dfrac{\Sigma\left(q_0\right)}{\Sigma\left(q_1\right)} \times 100$

C. $\dfrac{\Sigma\left(q_1\right)}{\Sigma\left(q_0\right)} \times 100$

D. $\dfrac{\Sigma\left(q_0\right)}{\Sigma\left(q_1\right)} \times 100$

Answer: C

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7. Fisher's Price Index Number is

A. $\sqrt{P_{01}(L) \times P_{01}(P)}$

B. $P_{01}(L) \times P_{01}(P)$

C. $\sqrt{P_{01}(L) \times P_{01}(P)} \times 100$

D. $\sqrt{P_{01}(L) \times P_{01}(P)}$

Answer: A

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8. Fisher's Price Index Number is

A. $\dfrac{\sum IW}{\sum W} \times 100$

B. $\dfrac{\sum IW}{\sum W}$

C. $\dfrac{\sum W}{\sum IW} \times 100$

D. $\dfrac{\sum W}{\sum IW}$

Answer: B

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9. The Cost of Living Index Number by Aggregate Expenditure Method is same as

A. Fisher's Price Index Number

B. Laspeyre's Price Index Number

C. Paasche's Price Index Number

D. Dorbish-Bowley's Price Index Number

Answer: C

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Part II 5. INDEX NUMBERS (II Fill in the blanks.)

1. Price Index Number by Simple Aggregate Method is given by ....

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2. Value Index Number by Simple Aggregate Method is given by ....

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3. Fisher's Price Index Number is given by ....

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4. Marshall-Edgeworth's Price Index Number is given by ....

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5. The Cost of Living Index Number by Aggregate Expenditure Method is given by ....

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6. The average of Laspeyre's and Paasche's Price Index Numbers is called.................Price Index Number.

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7. Quantity Index Number by Weighted Aggregate Method is given by ....

Watch Video Solution

8. Price Index Number by Simple Aggregate Method is given by ....

Watch Video Solution

Part II 5. INDEX NUMBERS (III) State whether each of the following is True or False.)

1. State True or False: Walsh's Price Index Number is given by

$$\frac{\sum p_1\sqrt{q_0 q_1}}{\sum p_0\sqrt{q_0 q_1}} \times 100$$

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2. State True or False: The three types of Index numbers are i) Price Index Number, ii) Quantity Index Number, iii) Value Index Number.

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3. For Cost of Living Index Number CLI $= \frac{\sum IW}{\sum}$, where $I = \frac{p_0}{p_1} \times 100$ and w = $p_0 q_0$

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4. A person buys a horse for 15 pounds. After one year, he sells it for 20 pounds. After one year, again he buys the same horse at 30 pounds. What is the overall profit percent for that person over the both the transactions if he again sells the horse for 40 pounds ?

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5. State True or False: $\sum \frac{q_1}{q_0} \times 100$ is the Quantiy Index Number by Simple Aggregate Method.

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6. State true or False: $\sum \frac{p_1 q_1}{p_0 q_1} \times 100$ is Paasche's Price Index Number.

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7. State True or False: $\frac{\sum p_0 \sqrt{q_0 + q_1}}{\sum p_1 \sqrt{q_0 + q_1}}$ is Marshall-Edgeworth Price Index Number.

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8. Fisher's Price Index Number is

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9. Value Index Number by Simple Aggregate Method is given by ....

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Part II 5. INDEX NUMBERS (IV) Solve the following problems.)

1. Find Price Index Number using Simple Aggregate method by taking 2005 as base year.

commodity	P	Q	R	S	T
Price in 2005 (in Rs.)	10	25	14	20	30
Price in 2015 (in Rs.)	32	40	20	45	70

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2. Find Quantity Index Number using Simple Aggregate method.

Commodity	A	B	C	D	E
Base year Quantity	170	150	100	195	205
Current year Quantity	90	70	75	150	95

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3. Calculate Value Index Number for the following using Simple Aggregate Method.

Commodity	Base Year		Current Year	
	Price	Quantity	Price	Quantity
A	30	13	40	15
B	40	15	70	20
C	10	12	60	22
D	50	10	90	18
E	20	14	100	16

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4. Calculate Quantity Index Number using Simple Aggregate method

Commodity	I	II	III	IV	V
Base year Quantity	140	120	100	200	225
Current year Quantity	100	80	70	150	185

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5. Find Price Index Number using Simple Aggregate method by taking 2000 as base year.

Commodity	Price (in Rs.) for year 2000	Price (in Rs.) for year 2007
Watch	900	1475
Shoes	1760	2300
Sunglasses	600	1040
Mobile	4500	8500

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6. Find x if the Price Index Number by Simple Aggregate Method is 125.

Commodity	P	Q	R	S	T
Base Year Price (in Rs.)	10	8	12	24	18
Current Year Price (in Rs.)	14	10	x	28	22

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7. Find values x and y if the Price Index Number by Simple Aggregate Method by taking 2001 as base year is 120, given

$\sum p_1 = 300$

Commodity	A	B	C	D
Price (in Rs) in 2001	90	x	90	30
Price (in Rs) in 2004	95	60	y	35

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8. Find x from following data if the Value Index Number is 200

Commodity	Base Year		Current Year	
	Price	Quantity	Price	Quantity
A	10	10	20	10
B	8	20	22	15
C	2	X	8	10
D	9	10	16	10
E	5	6	3	10

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9. Calculate a) Laspeyre's, b) Paasche's, and c) Dorbish-Bowley's Price Index Numbers for following data.

Commodity	Base Year		Current Year	
	Price	Quantity	Price	Quantity
A	10	9	50	8
B	20	5	60	4
C	30	7	70	3
D	40	8	80	2

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10. Calculate Marshall-Edgeworth Price Index Number for following.

Commodity	Base Year		Current Year	
	Price	Quantity	Price	Quantity
A	8	20	11	15
B	7	10	12	10
C	3	30	5	25
D	2	50	4	35

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11. Calculate Walsh's price Index Number for the following data.

Commodity	Base Year		Current Year	
	Price	Quantity	Price	Quantity
I	10	12	40	3
II	20	2	25	8
III	30	3	50	27
IV	60	9	90	36

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12. If $P_{01}(L) = 40$ and $P_{01}(P) = 90$, find$P_{01}(D - B)$ and $P_{01}(F)$.

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13. If Laspeyre's and Paasche's Price Index Numbers are 50 & 72 respectively, find Dorbish-Bowley's and Fisher's Price Index Numbers

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14. Given

$P_{01}(M - E) = 120, \sum p_1q_1 = 300, \sum p_0q_0 = 120 \sum p_0q_1 = 320$

Find $p_{01}(L)$

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15. Find the missing price if Laspeyre's and Paasche's Price Index Numbers are equal for following data.

Commodity	Base Year		Current Year	
	Price	Quantity	Price	Quantity
A	1	10	2	5
B	1	5	–	12

Watch Video Solution

16. If $\sum p_0q_0 = 150, \sum p_0q_1 = 250, \sum p_1q_1 = 375$ and $p_{01}(L) = 140$ find p_{01} (M-E)

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17. Calculate the Cost of Living Index Number for the following data.

Group	Base Year		Current Year
	Price	Quantity	Price
Food	40	5	20
Clothing	30	10	35
Fuel and Lighting	20	17	10
House Rent	60	22	10
Miscellaneous	70	25	8

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18. Calculate the Cost of Living Index by Family Budget method in following example where W are wages of base year and I are current year price relatives.

Group	Food	Clothing	Fuel and Lighting	House Rent	Miscella-neous
I	150	140	100	120	200
W	4	3	3	4	6

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19. Find the missing wage if the Cost of Living Index for the following data is 150.

Group	Food	Clothing	Fuel and Lighting	House Rent	Miscella - neous
I	200	150	140	100	120
W	6	4	x	3	4

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20. The Cost of Living Index Numbers for years 2003 and 2008 are 150 and 200 respectively. A person earned Rs. 18,000 per month in year 2003. What should be his earning per month in year 2008, so as to maintain same standard of living as 2003?

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21. Given the following table, find the Cost of living Index Number using Aggregate Expenditure Method bycompleting the activity.

Group	P_0	Q_0	P_1	P_0Q_0	P_1Q_0
A	23	4	25	.....	100
B	15	5	20	75	.....
C	5	9	8	....	72
D	12	5	18	60	.....
E	8	6	13	....	78
Total	-	-	-	320	$\boxed{}$

Therefore Cost of Living Index using Aggregate Expenditure method is

$$\text{CLI} = \frac{\sum p_1 q_0}{\sum p_0 q_0} \times 100$$

$$= \square$$

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Part II 5. INDEX NUMBERS (V Activity)

1. Given the following table, find Walsh's Price Index Number by completing the activity.

Commodity	P_0	Q_0	P_1	Q_1	Q_0Q_1	$\sqrt{Q_0\,Q_1}$	$P_0\sqrt{Q_0\,Q_1}$	$P_1\sqrt{Q_0\,Q_1}$
I	20	9	30	4	36	.....	.....	180
II	10	5	50	5	.....	5	50	□
III	40	8	10	2	16	....	160	□
IV	30	4	20	1	.....	2	....	40
Total	-	-	-	-	-		390	□

Walsh's price Index Number is

$$P_{01}(w) = \frac{\ldots.\,.}{\sum p_0\sqrt{q_0q_1}} \times 100$$

$$= \frac{510}{\ldots.\,.} \times 100$$

$$= \square$$

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Part II LINEAR PROGRAMMING PROBLEMS (1. Select the most appropriate option for each of the following.)

1. If LPP has optimal solution at two point then,

A. LPP will give unique solution

B. LPP will give two solutions.

C. LPP will give infinite solutions.

D. LPP will not give any convex set.

Answer: C

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2. The feasible region is the set of point which satisfy

A. common region determined by all the constraints

B. common region determined by the non-negativity constraints

C. either of the options a or b

D. either of the options a or b

Answer: D

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3. The maximum value of $Z = 3x + 5y$subjected to the constraints $x + y \leq 2, 4x + 3y \leq 12, x \geq 0, y \geq 0$ is

A. 10

B. 9

C. 15

D. 20

Answer: A

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4. The minimum value of $Z = 4x + 5y$ subjected to the constraints $x + y \geq 6, 5x + y \geq 10, x \geq 0, y \geq 0$ is

A. 28

B. 24

C. 30

D. 31

Answer: B

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5. The point at which the minimum value of $z = 8x + 12y$ subject to the constraints $2x + y \geq 8, x + 2y \geq 10x \geq 0, y \geq 0$ is obtained is

A. (8,0)

B. (9, 1)

C. (2, 4)

D. (10, 0)

Answer: C

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6. The point at which the maximum value of $Z = 4x + 6y$ subject to the constraints $3x + 2y \leq 12, x + y \geq 4, x \geq 0, y \geq 0$ is obtained at the point

A. (0,6)

B. (6,0)

C. (0,4)

D. (4,0)

Answer: A

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7. The maximum vlaue of $Z = 9x + 13y$ subject to constraints $2x + 3y \leq 18, 2x + y \leq 10, x \geq 0, y \geq 0$ is

A. (3,4)

B. (0, 6)

C. (5, 0)

D. (9, 0)

Answer: A

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8. The Corner points of feasible region for the inequations , $x + y \leq 5, x + 2y \leq 6, x \geq 0, y \geq 0$ are

A. (0,3),(5,0),(0,5),(6,0)

B. (0,3),(5,0),(4,1),(0,0)

C. (0,0),(1,4),(5,0),(0,3)

D. (3,0),(0,5)(0,0),(4,1)

Answer: B

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9. The corner points of the feasible region are $(0, 3), (3, 0), (8, 0), \left(\frac{12}{5}, \frac{38}{5}\right)$ and $(0, 10)$, then the point of maximum $z = 6x + 4y = 48$ is at

A. $(0, 3)$

B. $(8, 0)$

C. $(12/5, 38/5)$

D. $(3, 0)$

Answer: B

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10. The corner points of the feasible region are $(4, 2), (5, 0), (4, 1)$ and $(6, 0)$ then the point of minimum $z = 3.5x + 2y = 16$ is at

A. (4,2)

B. (5,0)

C. (6,0)

D. (4,1)

Answer: D

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11. The constraint that in a college there are more scholarship holders in FYJC class(X) than in SYJC class (Y) is given by

A. $X > Y$

B. $X \leq Y$

C. $X = Y$

D. $X < Y$

Answer: A

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12. How does a constraint," A washing machine can hold up to 8 kilograms of cloths(X)" can be given?

A. $X \geq 8$

B. $X \leq 8$

C. $X \neq 8$

D. $X = 8$

Answer: B

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Part II LINEAR PROGRAMMING PROBLEMS (B. State whether each of the following statement is TRUE or FALSE)

1. State True or False:

The maximum value of $Z = 5x + 3y$ subject to constraints $3x + y \leq 12, 2x + 3y \leq 18, 0 \leq x, y$ is 20.

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2. Objective function of LPP is a relation between the decision variables. (True/False)

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3. If LPP has two optimal solutions then the LPP has infinitely many solution.(True/False)

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4. state true or false

LPP is related to efficient use of limited resources.

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5. state true or false

A convex set includes the points but not the segment joining the points.

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6. State True or False:

If the corner points of the feasible region are (0, 7/3),(2,1), (3, 0) & (0,0) then the maximum value of $Z = 4x + 5y$ is 12 .

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7. State True or False:

If the corner points of the feasible region are (0, 10),(2, 2) & (4, 0) then the minimum value of $Z = 3x + 2y$ is at (4, 0)

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8. The half plane represented by $3x + 4y \geq 12$ includes the point (4,3). (True/False)

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9. state true or false

Corner point method is most suitable method for solving the LPP graphically

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10. Of all the points of feasible region, the optimal value is obtained at the boundary of the feasible region.

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11. State True or False:

The point (6,4) does not belong to the feasible region bounded by $8x + 5y \leq 60, 4x + 5y \leq 40, 0 \leq x, y$

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12. State True or False :

The Graphical solution set of the inequation $0 \le y, x \ge 0$ lies in second quadrant.

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Part II LINEAR PROGRAMMING PROBLEMS (C. Fill in each of the following blanks)

1. The variables involved in LPP are called ____________

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2. Constraints are always in the form of _________ or_________

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3. A set of values of variables satisfying all the constraints of LPP is known as _______.

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4. By spending almost ₹ 250 ,Rakhi bought some kg grapes(x) & some dozens of bananas(y), then as a constraint this information can be expressed by______

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5. Tyco Cycles Ltd manufactures bicycles(x) & tricycles(y).The profit earned from the sales of each bicycle & a tricycle is ₹400 & ₹200 respectively, then the total profit earned by the manufacturer will be given as

____

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6. A doctor prescribed 2 types of vitamin tablets, T_1 & T_2 for Mr. Dhawan. The tablet T_1 contains 400 units of vitamin & T_2 contains 250 units of vitamin. If his requirement of vitamin is at least 4000 units then the inequation for his requirement will be ______.

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7. Regions represented by equation $x \geq 0, y \geq 0$ is

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8. Heramb requires at most 400 calories from his breakfast. Every morning he likes to take oats & milk. If each bowl of oats & a glass of milk provides him 80 calories & 50 calories respectively, then as a constraint this information can be expressed as __________

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9. Ganesh owns a godown used to store electronic gadgets like refrigerator(x) & microwave(y),If the godown can accommodate at most 75 gadgets, then this can be expressed as a constraint by ______________

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10. Ms. Mohana want to invest at least ₹55000 in Mutual funds & fixed deposits, Mathematically this information can be written as __________.

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11. If the feasible region is bounded by the inequations $2x + 3y \leq 12, 2x + y \leq 8, 0 \leq x, 0 \leq y$ then point (5,4) is _______ of the feasible region.

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12. The constraint that in a particular XII class, number of boys(y) are less than number of girls(x) is given by____________.

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Part II LINEAR PROGRAMMING PROBLEMS (D. Solve the following problems)

1. A company produces two types of goods A and B, that require gold and silver. Each unit of type A requires 3 g of silver and 1 g of gold while that of type B requires 1 g of silver and 2 g of gold. The company can procure a maximum of 9 g of silver and 8 g of gold. If each unit of type A brings a profit of < 40 and that of type B < 50, formulate LPP to maximize profit.

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2. A dealer deals in two products X & Y. He has ₹1,00,000/- to invest & space to store 80 pieces. Product X costs ₹ 2500/- & product Y costs ₹ 1000/- per unit. Construct the

LPP and find the number of units of each product to be purchased.

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3. A company manufactures two types of ladies dresses ,C & D. The raw material & labour available per day is given in the table.

Resources	Dress C(x)	Dress D(y)	Max. availability
Raw material	5	4	60
Labour	5	3	50

P is the profit, if P = 50x + 100y, solve this LPP to find x & y to get the maximum profit.

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4. Food X contains 4 units of vitamin A per gram and 7 units of vitamin B per gram and cost 15 paise per gram . Food Y contains 6 units of vitamin A per gram and 11 units of vitamin B per gram and cost 22 paise per gram . The daily minimum requirement of vitamin A and B are 90 units and 130 units respectively . The formulation of LPP to minimize the cost is

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5. (Allocation problem) A cooperative society of farmers has 50 hectare of land to grow two crops X and Y. The profit from crops X and Y per hectare are estimated as Rs

10,500 and Rs 9,000 respectively. To control weeds, a liquid herbicide has to be

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6. A wholesale dealer deals in two kinds of mixtures A & B of nuts. Each kg of mixture A contains 60 grams of almonds, 30 grams of cashew & 30 grams of hazel nuts. Each kg of mixture B contains 30 grams of almonds, 60 grams of cashew & 180 grams of hazel nuts. A dealer is contemplating to use mixtures A & B to make a bag which will contain at least 240 grams of almonds, 300 grams of cashew and 540 grams of hazel nuts Mixture A costs ₹8 & B costs ₹12 per kg. How many kgs of each mixture should he use to minimize the cost of the kgs.

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7. Maximize $z = 2x + 3y$ subject to constraints $x + 4y \leq 8, 3x + 2y \leq 14, x \geq 0, y \geq 0.$

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8. Maximize $z = 5x + 10y$ subject to constraints $x + 2y \leq 10, 3x + y \leq 12, x \geq 0, y \geq 0$

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9. Maximize $Z = 400x + 500y$ subject to constraints $x + 2y \leq 80, 2x + y \leq 90, x \geq 0, y \geq 0$

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10. Minimize $z = 24x + 40y$ subject to constraints $6x + 8y \geq 96, 7x + 12y \geq 168, x \geq 0, y \geq 0$

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11. Minimize $Z = x + 4y$ subject to constraints $x + 3y \geq 3, 2x + y \geq 2, x \geq 0, y \geq 0$

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12. Minimize $Z = 2x + 3y$ subject to constraints $x + y \geq 6, 2x + y \geq 7, x + 4y \geq 8, x \geq 0, y \geq 0$

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Part II LINEAR PROGRAMMING PROBLEMS (E. Activities)

1. Amartya wants to invest ₹45,000 in Indira Vikas Patra (IVP) & in Public Provident fund (PPF). He wants to invest at least ₹ 10,000 in PPF & at least ₹5000 in IVP. If the rate of interest on PPF is 8% per annum & that on IVP is 7% per annum. Formulate the above problem as LPP to determine maximum yearly income.

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2. The maximum vlaue of $Z = 9x + 13y$ subject to constraints $2x + 3y \leq 18, 2x + y \leq 10, x \geq 0, y \geq 0$ is

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3. Solve the LPP graphically: Minimize $Z = 4x + 5y$ Subject to the constraints $5x + y \geq 10, x + y \geq 6, x + 4y \geq 12, x, y \geq 0$

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Part II ASSIGNMENT PROBLEMS AND SEQUENCING (I. Select and write the most appropriate answer from the given alternatives for each sub question.)

1. The assignment problem is generally defined as a problem of ....

A. maximization

B. minimization

C. allocation

D. restriction

Answer: B

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2. Assignment Problem is special case of ....

A. Linear Programming Problem

B. Unbalanced Problem

C. Restricted Problem

D. Sequencing Problem

Answer: A

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3. The assignment problem is solved by ....

A. Simplex method

B. vector method

C. Hungarian method

D. Graphical method

Answer: C

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4. The cost matrix of an unbalanced assignment problem is not a ...

A. Unit matrix

B. triangular matrix

C. rectangular matrix

D. square matrix

Answer: D

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5. When an assignment problem has more than one solution, then it is...

A. double optimal solution

B. infinite optimal solution

C. multiple optimal solution

D. dual optimal solution

Answer: C

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6. The assignment problem is said to be balanced if...

A. no. of rows = no. of columns

B. no. of rows $\neq$ no. of columns

C. no. of rows $<$ no. of columns

D. no. of rows $>$ no. of columns

Answer: A

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7.

Machine	Job			
	A	B	C	D
I	5	6	8	4
II	4	7	9	10

The optimal sequence for above data is

A. CDBA

B. DBCA

C. BCDA

D. ABCD

Answer: B

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8. In sequencing, an optimal path is one that minimizes ....

A. Elapsed time

B. Idle time

C. Both (a) and (b)

D. Ready time

Answer: C

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9. If there are 3 machines A, B and C, conditions for reducing a 3machine problem to a 2 machine problem with respect to minimum processing time is...

A. $\text{Min}Ai \geq MaxBiORM \in Ci \geq MaxBi, i = 1, 2, 3 \ldots n.$

B. $\text{Min}Ai \leq MaxBiOR\text{Min}C \leq MaxBi, i = 1, 2, 3, \ldots n.$

C. $MaxAi \geq \text{Min}BiORMaxB \geq \text{Min}Ai, i = 1, 2, 3, \ldots n.$

D. Max Ai $\leq$ Min Bi OR Max B $\leq$ Min Ai, i=1,2,3,...n.

Answer: A

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10. The objective of sequencing problem is

A. to find the order in which jobs are to be made

B. to find the time required for the completing all the job on hand

C. to find the sequence in which jobs on hand are to be processed to minimize the total time required for processing the jobs.

D. to maximization the cost.

Answer: C

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11. If there are n jobs and m machines, then there will be ....sequence of doing jobs.

A. mn

B. $m(n!)$

C. n^m

D. $(n!)^m$

Answer: D

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12. In solving 2 machine and n jobs sequencing problem, the following assumption is wrong

A. No passing is allowed

B. Processing times are known

C. Handling time is negligible

D. The time of passing depends on the order of machining.

Answer: D

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Part II ASSIGNMENT PROBLEMS AND SEQUENCING (II. Fill in the blanks)

1. If the given matrix is ...... matrix, the assignment problem is called balanced problem.

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2. An unbalanced assignment problems can be balanced by adding dummy rows or columns with ...... cost.

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3. A .... assignment problem does not allow some worker(s) to be assign to some job(s).

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4. In an assignment problem if number of rows is greater than number of columns, then dummy ..... is added.

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5. The Hungarian method is an .... algorithm that solves an assignment problem.

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6. In assignment problem each worker or machine is ...... capable of handling any job.

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7. In sequencing problems one has to .... the total processing time or cost.

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8. In sequencing problem the time which required to complete all the jobs i.e. entire task is called ....

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9\. ..... time is the time when the machine is available but is waiting for a job to be processed.

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10\. In sequencing problem the time required to transfer a job from one machine to another is.....

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11\.

Books	A	B	C	D
Printing	5	8	10	7
Data Entry	7	4	3	6

The optimum sequence for the above data is ....

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12. In sequencing problem one has to determine the .... in which jobs has to processed through the machines.

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Part II ASSIGNMENT PROBLEMS AND SEQUENCING (III. State whether each of the following is true or false.)

1. State True or False: The objective of an assignment problem is to assign number of jobs to equal number of persons at maximum cost.

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2. State True or False: To convert the assignment problem into maximization problem, the smallest element in the matrix is to deducted from all other elements.

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3. Optimal assignments are made in the Hungarian method to cells in the reduced matrix that contain a zero. (True/False)

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4. State True or False: In assignment problem, if number of column is greater than number of rows, then a dummy row is added.

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5. The Hungarian method is used to assign n jobs on 2 machines to get the optimal sequence. (True/False)

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6. In assignment problem each worker or machine is assigned only one job. (True/False)

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7. One of the assumptions is made while sequencing n jobs on 2 machines is: two jobs must be loaded at a time on any machine. (True/False)

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8. State True or False: The Total Elapsed is the time required to complete all the jobs i.e. entire task.

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9. The idle time for a machine is the time when machine is available but is not waiting for any job to be processed. (True/False)

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10. In sequencing problem the processing times are dependent of order of processing the jobs on machine. (True/False)

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11. In sequencing problem each job once started on any machine must be processed still its completion.

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12. In sequencing problem each machine is of different type.

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Part II ASSIGNMENT PROBLEMS AND SEQUENCING (IV. Attempt the following questions)

1. Four new machines M_1, M_2, M_3 and M_4 are to be installed in machine shop. There are five vacant places A, B, C, D and E available. Because of limited space, machine M_2 cannot be placed at C and M_3 cannot be placed at A. The cost of matrix given below:

Machines	Places				
	A	B	C	D	E
M_1	4	6	10	5	6
M_2	7	4	-	5	4
M_3	-	6	9	6	2
M_4	9	3	7	2	3

Find the optimal assignment schedule.

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2. Solve the following assignment problem to maximize sales:

Salesmen	Territoris				
A	I	II	III	IV	V
B	11	16	18	15	15
C	7	19	11	13	17
D	9	6	14	14	7
E	13	12	17	11	13

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3. Consider the problem of assigning of five operators to five machines. The assignment costs are given in the following table:

Operator	Machine				
	1	2	3	4	5
A	6	6	-	3	7
B	8	5	3	4	5
C	10	4	6	-	4
D	8	3	7	8	3
E	7	6	8	10	2

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4. Find the assignments of salesman to various district which will yield maximum profit.

Salesman	District			
	1	2	3	4
A	16	10	12	11
B	12	13	15	15
C	15	15	11	14
D	13	14	14	15

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5. A dairy plant has five milk tankers, I, II, III, IV and V. Three milk tankers are to be used on five delivery routes A, B, C, D & E. The distances (in kms) between the diary plant and the delivery routes are given in the following distance matrix.

	I	II	III	IV	V
A	150	120	175	180	200
B	125	110	120	150	165
C	130	100	145	160	170
D	40	40	70	70	100
E	45	25	60	70	95

How should the milk tankers be assigned to the chilling center so as to minimize the distance travelled?

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6. Find the sequence that minimizes the total elapsed time to complete the following jobs. Each job is processed in the order AB:

Machines	Jobs (Processing times in minutes)						
	I	II	III	IV	V	VI	VII
Machine A	12	6	5	11	5	7	6
Machine B	7	8	9	4	7	8	3

Determine the sequence for the jobs so as to minimize the processing time. Find the total elapsed time and the idle times for both the machines.

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7. Find the optimal sequence that minimizes total time required to complete the following jobs in the order ABC.

The processing times are given in hours .

Jobs	I	II	III	IV	V
Lathe	4	1	5	2	5
Surface Grinder	3	2	4	2	6

Jobs	I	II	III	IV	V	VI	VII
Machine A	6	7	5	11	6	7	12
Machine B	4	3	2	5	1	5	3
Machine C	3	8	7	4	9	8	7

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8. Five jobs must pass through a lathe and a surface grinder, in that order. The processing time in hours are shown below. Determine the optimal sequence of the jobs. Also, find the idle time of each machine:

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9. A toy manufacturing company produces five types of toys. Each toy has to go through three machines A, B, C in the order ABC. The time required in hours for each process is given in the following table:

Type	1	2	3	4	5
Machine A	16	20	12	14	22
Machine B	10	12	4	6	8
Machine C	8	18	16	12	10

Solve the problem for minimizing the total elapsed time.

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10. Find the sequence that minimizes total elapsed time to complete the following jobs in the order XY. Find the total elapsed time and idle times for each machine.

Jobs	A	B	C	D	E
Machine X	10	2	18	6	20
Machine Y	4	12	14	16	8

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Part II ASSIGNMENT PROBLEMS AND SEQUENCING (V. Activities)

1. For the following assignment problem minimize total man hours:

Subordinates	Required hours for task			
	I	II	III	IV
A	7	25	26	10
B	12	27	3	25
C	37	18	17	14
D	18	25	23	9

Subtract the ___element of each ___From very element of that_____

Subordinates	Required hours for task			
	I	II	III	IV
A	0	18	19	3
B	9	24	0	22
C	23	4	3	0
D	9	16	14	0

Subtract the smallest element in each column from______

of that column.

Subordinates	Required hours for task			
	I	II	III	IV
A	□	□	19	□
B	□	□	0	□
C	□	□	3	□
D	□	□	14	□

The lines covering all zeros is ______to the order of matrix______.The assignment is made as follows:

subordinates	Required hours for task			
	I	II	III	IV
A	0	14	9	3
B	9	20	0	22
C	23	0	3	0
D	9	12	14	0

Optimum solution is shown as follows:

$A \to \square, \square \to III, C \to \square, \square \to IV$

Minimum hours required is _____hours.

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2. Solve the following problem of sequencing for minimizing the total elapsed time and idle time for both the machines.

Job	P	Q	R	S	T	U
M_1	1	4	6	3	5	2
M_2	3	6	8	8	1	5

The optimal sequence of the jobs as follows:

Total elapsed time is obtained as follows:

Job sequence	Machine A		Machine B		Idle time for Machine B
	Time In	Time Out	Time In	Time Out	
P	□	1	1	□	□
U	□	3	4	□	□
S	□	6	9	□	□
Q	□	10	17	□	□
R	□	16	23	□	□
T	□	21	31	□	□

Total elapsed time $T = \square$ minutes

Idle time for Machine $A = T - \square = \square$ minutes

Idle time for Machine $B = \square$

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Part II PROBABILITY DISTRIBUTIONS (I. Choose the correct alternative.)

1. The variance of a Binomial distribution is given by

A. np

B. pq

C. npq

D. $\sqrt{npq}$

Answer: C

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2. F(x) is c.d.f. of discrete r.v. X whose distribution is

x_i	-2	-1	0	1	2
p_i	0.2	0.3	0.15	0.25	0.1

then $F(-3) = \ldots\ldots.$.

A. 0

B. 1

C. 0, 2

D. 0.15

Answer: A

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3. If X denotes the number obtained on the uppermost face when a fair die is thrown, then E (X) =

A. 3.0

B. 3.5

C. 4.0

D. 4.5

Answer: B

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4. If p.m.f. of r. v. X is given below.

x	0	1	2
$P(x)$	q^2	$2pq$	p^2

then $Var(x)$ = ...

A. p^2

B. q^2

C. pq

D. $2pq$

Answer: D

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5. The expected value of the sum of the two numbers obtained when two fair dice are rolled is

A. 5

B. 6

C. 7

D. 8

Answer: C

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6. If $X \sim B\left(20, \frac{1}{10}\right)$, then $E(x) = \dots\dots\dots\dots$.

A. 2

B. 5

C. 4

D. 3

Answer: A

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7. Bernoulli trials is categorized if it satisfies the conditions :-

A. The trials are independent.

B. The probability of success remains the same in all trials.

C. a but not b

D. both a and b

Answer: D

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8. For the Poisson distribution

A. Mean= E(X) = m

B. Var(X) = m

C. Mean = E(X) = m and Var(X) = m

D. Mean = $E(X) \neq m$ and $Var(X) = m$.

Answer: C

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9. A discrete random variable X is said to follow the Poisson distribution with parameter $m \geq 0$ if its p. m. f. is given by $P(X = x) = \dfrac{e^{-m} m^x}{x}, x = 0, 1, 2, \ldots.$ True or False.

A. $m > 0$

B. $m \geq 0$

C. $m \neq 1$

D. $m = 0$

Answer: A

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Part II PROBABILITY DISTRIBUTIONS (II. Fill in the blanks)

1. The values of discrete r.v. are generally obtained by ....

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2. The scalar product of 5i + j – 3k and 3i – 4j + 7k is:

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3. If X is discrete random variable takes the values $x_1, x_2, x_3, \ldots x_n$ then $\sum i = 1P\left(x_i\right) = \ldots\ldots\ldots$.

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4. E(x) is considered to be .... of the probability distribution of x.

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5. In Binomial distribution probability of success ---------------from trial to trial.

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6. In Binomial distribution if n is very large and probability of success of p is very small such that np = m (constant) then..............distribution is applied

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7. When n is very large and p is very small in the binomial distribution, then X follows the Poisson distribution with parameter m =

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Part II PROBABILITY DISTRIBUTIONS (III. State whether each of the following is True or False.)

1. If X denotes the number obtained on the uppermost face when a fair die is thrown, then E (X) =

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2. If $f(x) = kx(1 - x)$, for $0 < x < 1 = 0$, otherwise , is the p.d.f. of a r. v. X then k = 12 . True or False.

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3. Let the random variable X follow B (6,p). If 16 $P(X = 4) = P(X = 2)$, then what is the value of p?

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4. If a r. v. X assumes the values 1,2,3,............,9 with equal probabilities then E(x) = 5.

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5. Let $X \sim B(n, p)$ then the mean or expected value of r. v. X is denoted by E(X) and is given by $\mu = E(X) = npq$. True or False

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6. A discrete random variable X is said to follow the Poisson distribution with parameter $m \geq 0$ if its p. m. f. is given by $P(X = x) = \dfrac{e^{-m}m^x}{x}, x = 0, 1, 2, \ldots.$ True or False.

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7. For the Binomial distribution , Mean E(X) = m and Variance = Var(X) = m. True or False.

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8. State whether True or False:

If n is very large and p is very small then X follows Poisson distribution with n = m p.

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9. c.d.f F(x) of a continous random variable X is defined as

.

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Part II PROBABILITY DISTRIBUTIONS (Solve the following)

1. Find the probability distribution of a) number of heads in two tosses of a coin, b) number of tails in three tosses of a coin.

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2. From a lot of 30 bulbs which include 6 defectives, a sample of 4 bulbs is drawn at random with replacement. Find the probability distribution of the number of defective bulbs.

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3. Find the expected value and variance of X using the following p.m. f.

x	-2	-1	0	1	2
$P(x)$	0.2	0.3	0.1	0.15	0.25

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4. Find the mean number of heads in three tosses of a fair coin.

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5. Two dice are thrown simultaneously. If X denotes the number of sixes, find the expectation of X.

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6. A pair of dice is thrown 3 times. If getting a doublet is considered a success, find the probability of two successes.

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7. Given X~ B (n,P)

If n= 10 and p=0.4 , find E(X) and Var (X) .

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8. If X has Poisson distribution with $m = 1$, then find $P(X \leq 1)$ given $e^{-1} = 0.3678$.

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9. If X has Poisson distribution with parameter m and $P(X = 2) = P(X = 3)$, then find $P(X \geq 2)$.

Use $e^{-3} = 0.0497$

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10. A random variable X has the following probability distribution:

x	1	2	3	4	5	6	7
$P(x)$	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2+k$

Determine $(i)k, (ii)P(X < 3), (iii)P(0 < X < 3), (iv)P(X > 4)$.

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11. The p. d. f. of a continuous r. v. Xis

$$f(x) = \begin{matrix} \frac{3x^2}{8} & 0 < x < 2 \\ 0 & \text{otherwise} \end{matrix}$$

Determine the c.d.f of X and hence find

(i) $P(X < 1), (ii)P(1 < X < 2)$.

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12. If a r. v. X has p. d.f. $f(x) = \begin{cases} \frac{c}{x} & 1 < x < 3, c < 0 \\ 0 & \text{otherwise} \end{cases}$

Find c, $E(X)$ and $Var(X)$. Also find $F(x)$.

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13. A die is thrown 6 times. If "getting an odd number" is a success, what is the probability of (i) 5 successes? (ii) at least 5 successes? (iii) at most 5 successes?

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14. The probability that a bulb produced by a factory will fuse after 200 days of use is 0.2. Let X denote the number of bulbs (out of 5) that fuse after 200 days of use . Find the probability of

$(i)X = 0, (ii)X \leq 1, (iii)X > 1, (iv)X \geq 1.$

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15. The number of complaints which a bank manager receives per day follows a Poisson distribution with parameter $m = 4$. Find the probability that the manager receives only two complaints on a given day. Use $e^{-4} = 0.0183$

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16. Defects on plywood sheet occur at random with the average of one defect per 50 Sq. ft. Find the probability that such a sheet has no defect. Use $e^{-1} = 0.3678$.

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17. It is known that, in a certain area of a large city, the average number of rats per bungalow is five. Assuming that the number of rats follows Poisson distribution, find the probability that a randomly selected bungalow has

i) exactly 5 rats (ii) more than 5 rats (iii) between 5 and 7 rats, inclusive.

Given $e^{-5} = 0.0067$.

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Part II PROBABILITY DISTRIBUTIONS (ACTIVITIES)

1. The probability distribution of a discrete r. v. X is as follows.

x	1	2	3	4	5	6
$P(X=x)$	k	$2k$	$3k$	$4k$	$5k$	$6k$

Find the value of k.

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2. Find the expected value and variance of the r. v. X if its probability distribution is as follows.

x	1	2	3
$P(X=x)$	1/5	2/5	2/5

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3. Let $X \sim B(n, p)$, If $n = 10$and $E(X) = 5$, Using the following activity find p and Var (X).

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4. The probability that a bomb will hit the target is 0.8. Using the following activity ,find the probability that ,out of 5 bombs , exactly 2 will miss the target.

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5. If X follows Poisson distribution such that P (X = 1) = 0.4 and P (X = 2) = 0.2, Then find the value of m

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MATHEMATICAL LOGIC

1. Which of the following statement is true ?

A. 3 + 7 = 4 or 3 - 7 = 4

B. If Pune is in Maharshtra, then Hyderabad is in Kerala

C. It is false that 12 is not divisble by 3

D. The square of any odd integer is even.

Answer: C

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2. Which of the following is not a statement ?

A. $2 + 2 = 4$

B. 2 is the only even prime number

C. Come here

D. Mumbai is not in Maharashtra

Answer: C

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3. Select and write the most appropriate answer from the given alternatives :

If p is any statement then $(p \vee \sim p)$ is a

A. Contingency

B. Contradiction

C. Tautology

D. None of these

Answer: C

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4. If p and q are two statements, then $(p \Rightarrow q) \Leftrightarrow (\sim q \Rightarrow \sim p)$ is

A. Contradiction

B. Tautology

C. Neither (i) nor (ii)

D. None of these

Answer: B

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5. Select and write the most appropriate answer from the given alternatives :

Negation of $p \rightarrow (p \vee \sim q)$ is

A. $\sim p \rightarrow (\sim p \vee q)$

B. $p \wedge (\sim p \wedge q)$

C. $\sim p \vee (\sim p \vee \sim q)$

D. $\sim p \rightarrow (\sim p \rightarrow q)$

Answer: B

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6. Consider the following statements :

p: He is intelligent

q: He is strong

Then symbolic form of statements 'it is wrong that he is intelligent or strong's

A. $\sim p \vee \sim q$

B. $\sim(p \wedge q)$

C. $\sim(p \vee q)$

D. $p \vee \sim q$

Answer: C

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7. A biconditional statement is the conjunction of two --------------- statements:

A. Negative

B. Compound

C. Connective

D. Conditional

Answer: D

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8. Select and write the most appropriate answer from the given alternatives :

If $p \rightarrow q$ is an implication, then the implication $\sim q \rightarrow \sim p$ is called its

A. Converse

B. Contrapositive

C. Inverse

D. Alternative

Answer: B

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9. State the negation of the statement: "The sun is not shining" .

A.

B.

C.

D.

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10. Select and write the most appropriate answer from the given alternatives :

The false statement in the following is

A. $p \wedge (\sim p)$ is contradication

B. $(p \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim p)$ is a contradiction

C. $\sim(\sim p) \leftrightarrow p$ is a tautology

D. $p \vee (\sim p) \leftrightarrow p$ is a toutology

Answer: B

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11. Find the negation of 10 + 20 = 30

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12. Attempt the following

State the truth Value of $x^2 = 25$

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13. Attempt the following

Write the negation of $p \rightarrow q$

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14. Attempt the following

State the truth value of $\sqrt{3}$ is not an irrational number

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15. Attempt the following

State the truth value of $(p \vee \sim p)$

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16. Attempt the following

State the truth value of $(p \wedge \sim p)$

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17. Attempt the following

If statements p, q are true and r, s are false, determine the truth values of the following.

(a) $\sim p \wedge (q \vee \sim r)$

(b) $(p \wedge \sim r) \wedge (\sim q \vee s)$

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18. Attempt the following

Write the following compound statements symbolically.

(a) Nagpur is in Maharashtra and Chennai is in Tamilnadu.

(b) Triangle is equilateral or isosceles.

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19. Attempt the following

Write the converse and contrapositive of the following statements.

"If a function is differentiable then it is continuous".

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20. Without using truth table show that

$\sim(p \vee q) \vee (\sim p \wedge q) \equiv \sim p$

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21. Write the negation of the statement "An angle is a right angle if and only if it is of measure 90°"

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22. Answer the following questions

Write the following statements in symbolic form

(a) Milk is white if and only if the sky is not blue

(b) If Kutab - Minar is in Delhi then Taj - Mahal is in Agra

(c) Even though it is not cloudy, it is still raining

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23. Use quantifiers to convert the given open sentence defined on N into a true statement

(a) $n^2 \geq 1$

(b) $3x$ - $4 < 9$

(c) $Y + 4 > 6$

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24. Answer the following questions

Examine whether the statement pattern is a tautology, contradiction or contingency

$(p \wedge \sim q) \rightarrow (\sim p \wedge \sim q)$

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25. Using truth table prove that $\sim p \wedge q$

$\equiv (p \vee q) \wedge \sim p$

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26. Write the dual of the following

13 is prime number and India is a democratic country.

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27. Answer the following questions

Write the converse, inverse and contrapositive of the statement "If it snows, then they do not drive the car"

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28. Answer the following questions

Examine whether the statement pattern $[p \to (\sim q \vee r)] \leftrightarrow \sim[p \to (q \to r)]$ is a tautology, contradiction or contingency.

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29. Answer the following questions

Using truth table prove that $p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$

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30. Answer the following questions

Without using truth table show that

$(p \vee q) \wedge (\sim p \vee \sim q) \equiv (p \vee \sim q) \wedge (\sim p \vee q)$

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31. With proper justification state the negation of

$(p \rightarrow q) \vee (\sim q \rightarrow \sim p)$

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32. Answer the following questions

Prepare truth table for `(p ^^ q) vv ~r

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1. The adjoint matrix of $\begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$ is

A. $\begin{bmatrix} 4 & 8 & 3 \\ 2 & 1 & 6 \\ 0 & 2 & 1 \end{bmatrix}$

B. $\begin{bmatrix} 1 & -1 & 0 \\ -2 & 3 & -4 \\ -2 & 3 & -3 \end{bmatrix}$

C. $\begin{bmatrix} 11 & 9 & 3 \\ 1 & 2 & 8 \\ 6 & 9 & 1 \end{bmatrix}$

D. $\begin{bmatrix} 1 & -2 & 1 \\ -1 & 3 & 3 \\ -2 & 3 & -3 \end{bmatrix}$

Answer: B

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2. If $A = \begin{bmatrix} \cos\alpha & -\sin\alpha & 0 \\ \sin\alpha & \cos\alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$ then A^{-1} is

A. A

B. $-A$

C. adj (A)

D. - adj (A)

Answer: C

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3. The solutiion of (x, y, z) the equation

$$\begin{bmatrix} -1 & 0 & 1 \\ -1 & 1 & 0 \\ 0 & -1 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix}$$ is (x, y, z)

A. (1, 1, 1)

B. (0, -1, 2)

C. (-1, 2, 2)

D. (-1, 0, 2)

Answer: D

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4. If ω is a complex cube root of unity then the matrix

$$A = \begin{bmatrix} 1 & \omega^2 & \omega \\ \omega^2 & \omega & 1 \\ \omega & 1 & \omega^2 \end{bmatrix}$$ is a

A. Singular matrix

B. Non-symmetric matrix

C. Skew-symmetric matrix

D. Non-Singular matrix

Answer: A

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5. If $A = \begin{bmatrix} 4 & -1 \\ -1 & k \end{bmatrix}$ such that $A^2 - 6A + 7I = 0$ and $k =$

A. 1

B. 3

C. 2

D. 4

Answer: C

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6. Simplify $\cos\theta\begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix} + \sin\theta\begin{bmatrix} \sin\theta & -\cos\theta \\ \cos\theta & \sin\theta \end{bmatrix}$

A. $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

B. $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$

D. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

Answer: D

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7. Let $A = \begin{bmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$. The only correct statement aboul the matrix A is

A. $A^2 = I$

B. A is a zero matrix

C. A^{-1} does not exit

D. A = (-1) I, where I is a unit matrix.

Answer: A

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8. If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, then A^{10} = ...

A. $\begin{bmatrix} \cos 10\alpha & -\sin 10\alpha \\ \sin 10\alpha & \cos 10\alpha \end{bmatrix}$

B. $\begin{bmatrix} \cos 10\alpha & \sin 10\alpha \\ -\sin 10\alpha & \cos 10\alpha \end{bmatrix}$

C. $\begin{bmatrix} \cos 10\alpha & \sin 10\alpha \\ -\sin 10\alpha & -\cos 10\alpha \end{bmatrix}$

D. $\begin{bmatrix} \cos 10\alpha & -\sin 10\alpha \\ -\sin 10\alpha & -\cos 10\alpha \end{bmatrix}$

Answer: B

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9. The element of second row and third column in the inverse of $\begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & 0 \\ -1 & 0 & 1 \end{bmatrix}$ is

A. -2

B. -1

C. 1

D. 2

Answer: B

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10. If $A = \begin{bmatrix} 4 & 5 \\ 2 & 5 \end{bmatrix}$, then $\left|(2A)^{-1}\right|$=....

A. $\frac{1}{30}$

B. $\frac{1}{20}$

C. $\frac{1}{60}$

D. $\frac{1}{40}$

Answer: D

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11. If $\begin{bmatrix} x - y - z \\ -y + z \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 5 \\ 3 \end{bmatrix}$ then the values of x, y and z are respectively

A. 0, -3, 3

B. 1, -2, 3

C. 5, 2, 2

D. 11, 8, 3

Answer: B

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12. The value of x, y, z for the following system of equations $x + y + z = 6, x - y + 2z = 5, 2x + y - z = 1$ are

A. $x = 1, y = 2, z = 3$

B. $x = 2, y = 1, z = 3$

C. $x = -1, y = 2, z = 3$

D. $x = y = z = 3$

Answer: A

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13. If $A = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$, then |A||adj A| =...

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14. If the system of equations $6x + 2y = 3$ and $kx + y = 2$ has a unique solution, find the value of k.

A.

B.

C.

D.

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15. Let $A = [1 - 1121 - 3111] and 10B = [- 422 - 50\alpha 123]$ If B

is the inverse of matrix A, then $\alpha =$ 2 (b) -2 (c) 5 (d) -2

A. -2

B. -1

C. 2

D. 5

Answer: D

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16. Matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 5 \\ 2 & 4 & 7 \end{bmatrix}$ then the value of $A_{31}A_{31} + a_{32}A_{32} + a_{33}A_{33}$ is

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17. For a invertible matrix A if $A(adjA) = \begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$ then $|A| =$

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18. IF the inverse of the matrix $\begin{bmatrix} \alpha & 14 & -1 \\ 2 & 3 & 1 \\ 6 & 2 & 3 \end{bmatrix}$ does not exist then the value of α is

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19. Select and write the most appropriate answer from the given alternatives in each of the following :

If $A = \begin{pmatrix} 2 & 2 \\ -3 & 2 \end{pmatrix}, B = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$, then $\left(B^{-1} \cdot A^{-1}\right)^{-1}$ is equal to

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20. $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ -\sin\theta & -\cos\theta \end{bmatrix}$ then find A^{-1}.

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21. If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ then find the value of $|A|^{-1}$

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22. If $A = \begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix}$, and AB = BA = I, then find the matrix B.

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23. If $A(\theta) = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ then prove that $A^2(\theta) = A(2\theta)$

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24. If $A = \begin{bmatrix} 1 & 2 \\ 3 & -2 \\ -1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 & 2 \\ 4 & -1 & 3 \end{bmatrix}$ then find the order of AB.

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25. If $A + I = \begin{bmatrix} 3 & -2 \\ 4 & 1 \end{bmatrix}$ then $(A + I)(A - I)$ is equal to

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26. If $A = \begin{bmatrix} 2 & -1 & 1 \\ -2 & 3 & -2 \\ -4 & 4 & -3 \end{bmatrix}$ then find A^2

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27. If $A = \begin{bmatrix} -2 & 4 \\ -1 & 2 \end{bmatrix}$ then A^2 is equal to

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28. If $A = \begin{bmatrix} 0 & 3 & 3 \\ -3 & 0 & -4 \\ -3 & 4 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$, find the mastrix

B'(AB)

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29. If $f(x) = x^2 - 2x - 3$ then find f(A) when $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$

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30. If $A = \begin{bmatrix} -1 \\ 2 \\ 3 \end{bmatrix}, B = \begin{bmatrix} 3 & 1 & -2 \end{bmatrix}$, find B'A'

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31. If A is an invertible matrix of order 3 and $|A| = 5$, then find $|adj\ A|$.

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32. If $A = \begin{bmatrix} 6 & 5 \\ 5 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 11 & 0 \\ 0 & 11 \end{bmatrix}$ then find A'B'

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33. If $A = \begin{bmatrix} 2 & 4 \\ 1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ then find $\left(A^{-1}B^{-1}\right)$

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34. If $A = \begin{bmatrix} 2 & 0 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$ then find the matrix X such that $A^{-1}X = B$

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35. Find the matrix X such that AX = I where $A = \begin{bmatrix} 6 & 17 \\ 1 & 3 \end{bmatrix}$

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36. Find A^{-1} using adjoint method, where

$A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$

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37. Find A^{-1} using column transformations :

$$A = \begin{bmatrix} 2 & -3 \\ -1 & 2 \end{bmatrix}$$

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38. Find the adjoint of matrix $A = \begin{bmatrix} 6 & 5 \\ 3 & 4 \end{bmatrix}$

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39. Transform $\begin{bmatrix} 1 & 2 & 4 \\ 3 & -1 & 5 \\ 2 & 4 & 6 \end{bmatrix}$ into an upper triangular matrix by using suitable row transformations.

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40. If $A = \begin{bmatrix} 0 & 4 & 3 \\ 1 & -3 & -3 \\ -1 & 4 & 4 \end{bmatrix}$, then find A^2 and hence find A^{-1}

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41. If $A = \begin{bmatrix} 0 & 1 \\ 2 & 3 \\ 1 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & 0 \end{bmatrix}$, then find $(AB)^{-1}$

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42. If $A = \begin{bmatrix} -4 & -3 & -3 \\ 1 & 0 & 1 \\ 4 & 4 & 3 \end{bmatrix}$, find adj (A)

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43. Solve the following equations by inverse method :

$2x + y = 5, 3x + 5y = -3$

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44. If A=$\begin{bmatrix} 1 & 2 & -1 \\ 3 & -2 & 5 \end{bmatrix}$, then $R_1 \leftrightarrow R_2$ and $C_1 \rightarrow C_1 + 2C_3$ given

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45. Three chairs and two tables costs Rs. 1850. Five chairs and three tables costs Rs. 2850. Find the cost of four chairs and one table by using matrices.

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46. v36.3

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47. Find the adjoint of matrix $A = \begin{bmatrix} 2 & 0 & -1 \\ 3 & 1 & 2 \\ -1 & 1 & 2 \end{bmatrix}$

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48. Find the matrix X such that

$$\begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 2 \\ 1 & 2 & 2 \end{pmatrix} X = \begin{pmatrix} 2 & 2 & -5 \\ -2 & -1 & 4 \\ 1 & 0 & -1 \end{pmatrix}.$$

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49. If $A = \begin{bmatrix} \sec\theta & \tan\theta & 0 \\ \tan\theta & \sec\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$, then $A^{-1} =$

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50. Transform $\begin{bmatrix} 1 & 2 & 4 \\ 3 & -1 & 5 \\ 2 & 4 & 6 \end{bmatrix}$ into an upper triangular matrix by using suitable row transformations.

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51. If $A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 2 & 3 \\ 1 & 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 5 \\ 2 & 4 & 7 \end{bmatrix}$, then find the matrix X such that XA = B

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52. Using elementary transformations, find the inverse of the matrix[2 - 332233 - 22]

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53. The inverse of the matrix $\begin{bmatrix} 1 & 0 & 0 \\ 3 & 3 & 0 \\ 5 & 2 & -1 \end{bmatrix}$ is

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54. Solve the following equations by the invers method :

$x + y + z = -1, x - y + z = 2, x + y - z = 3.$

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55. If three numbers are added , their sum is 2 . If two times the second number is subtracted from the sum of first and third numbers we get 8 and if three times the first number added to the sum of second and third numbers we get 4 . Find the numbers using matrices .

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56. Find the inverse of the matrix $\begin{pmatrix} 1 & 0 & 1 \\ 0 & 2 & 3 \\ 1 & 2 & 1 \end{pmatrix}$ by using elementary column transformations .

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57. If $A = \begin{bmatrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{bmatrix}$ is a non-singular matrix, then find A^{-1} by using elementary row transformations. Hence, write the inverse of $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$

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58. Find the inverse of $A = \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$

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59. If $A = \begin{bmatrix} 1 & 1 \\ 1 & 2 \end{bmatrix}, B = \begin{bmatrix} 4 & 1 \\ 3 & 1 \end{bmatrix},$ and $C = \begin{bmatrix} 24 & 7 \\ 31 & 9 \end{bmatrix},$ then find the matrix X such that AXB = C

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60. If $A = \begin{pmatrix} 1 & -1 & 2 \\ 3 & 0 & -2 \\ 1 & 0 & 3 \end{pmatrix}$, verify that A (adj A) = $|A| \cdot I$.

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61. If $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}, B = \begin{bmatrix} 1 & 0 \\ 3 & 1 \end{bmatrix}$, find AB and $(AB)^{-1}$

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62. Solve the following system of equations by using matrix inversion method.

$x+y=1, y+z=\frac{5}{3}$ and $z+x=\frac{4}{3}$

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63. The cost of 4 dozen pencils, 3 dozen pens and 2 dozen erasers is Rs. 60.

The cost of 2 dozen pencils, 4 dozen pens and 6 dozen erasers is Rs. 90 whereas the cost of 6 dozen pencils, 2 dozen pens and 3 dozen erasers is Rs. 70. Find the cost of each item per dozen by using matrices.

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1. The principal solution $\sqrt{2}\sec x - 2 = 0$ are

A. $\frac{\pi}{3}, \frac{11\pi}{6}$

B. $\frac{\pi}{6}, \frac{11\pi}{6}$

C. $\frac{\pi}{4}, \frac{11\pi}{4}$

D. $\frac{\pi}{6}, \frac{11\pi}{3}$

Answer: B

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2. If $\cos A = \frac{\sin B}{2\sin C}$, then ΔABC is

A. an equilateral triangle

B. a right angled triangle

C. an isosceles triangle

D. an isosceles right angled triangle

Answer: C

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3. If $\sin^{-1}x - \cos^{-1}x = \frac{\pi}{6}$, then $: x =$

A. $\frac{1}{2}$

B. $\frac{\sqrt{3}}{2}$

C. $-\frac{1}{2}$

D. $-\frac{\sqrt{3}}{2}$

Answer: B

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4. The principal value of $\sin^{-1}\left(\frac{1}{2}\right)$ is

A. $\frac{\pi}{3}$

B. $\frac{\pi}{6}$

C. $\frac{2\pi}{3}$

D. $\frac{3\pi}{2}$

Answer: D

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5. Find the principal value of: $\cos^{-1}\left(-\frac{1}{2}\right)$

A. $\frac{\pi}{3}$

B. $\frac{\pi}{6}$

C. $\frac{2\pi}{3}$

D. $\frac{3\pi}{2}$

Answer: C

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6. In ΔABC, if $\angle A = 30^{\circ}$, $\angle B = 60^{\circ}$, then the ratio of sides is__________.

A. $1 : \sqrt{3} : 2$

B. $2 : \sqrt{3} : 1$

C. $\sqrt{3} : 1 : 2$

D. $\sqrt{3} : 2 : 1$

Answer: A

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7. In ΔABC, if $b^2 + c^2 - a^2 = \text{bc}$, then $\angle A =$ __________.

A. $\frac{\pi}{4}$

B. $\frac{\pi}{3}$

C. $\frac{\pi}{2}$

D. $\frac{\pi}{6}$

Answer: B

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8. If polar co-ordinates of a point are $\left(\frac{3}{4}, \frac{3\pi}{4}\right)$, then its Cartesian co-ordinate are ___________.

A. $\left(\frac{3}{4\sqrt{2}}, -\frac{3}{3\sqrt{2}}\right)$

B. $\left(\frac{3}{4\sqrt{2}}, \frac{3}{4\sqrt{2}}\right)$

C. $\left(-\frac{3}{4\sqrt{2}}, \frac{3}{4\sqrt{2}}\right)$

D. $\left(-\frac{3}{4\sqrt{2}}, -\frac{3}{4\sqrt{2}}\right)$

Answer: C

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9. $\tan^{-1}\left(\tan\frac{7\pi}{6}\right)$

A. $-\frac{\pi}{6}$

B. $\frac{\pi}{6}$

C. $\frac{13\pi}{6}$

D. $\frac{5\pi}{6}$

Answer: B

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10. If $\sin\left(\sin^{-1}\left[\frac{1}{5}\right] + \cos^{-1}x\right) = 1$,then x is

A. $\frac{1}{5}$

B. $-\frac{1}{5}$

C. 5

D. -5

Answer: A

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11. Evaluate $\cot\left(\tan^{-1}(2x) + \cot^{-1}(2x)\right)$

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12. In any triangle ABC prove that: $c\cos B - b\cos A = a^2 - b^2$

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13. In ΔABC, if $\sin^2 A + \sin^2 B = \sin^2 C$, then show that $a^2 + b^2 = c^2$.

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14. The polar co-ordinates of the point whose cartesian co-ordinates are $\left(1, \sqrt{3}\right)$, are

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15. Prove that $2\tan^{-1}\left(\frac{3}{4}\right) = \tan^{-1}\left(\frac{24}{7}\right)$

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16. Evaluate $\sin\left[\cos^{-1}\left(\frac{3}{5}\right)\right]$

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17. In ΔABC, a = 3, b = 4 and $\sin A = \frac{3}{4}$, find $\angle B$.

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18. Find the principal solutions of cosec x = 2.

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19. Find the general solutions of sin x - 1 = 0

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20. Find the Cartesian co-ordinates of point whose polar co-ordinates are $\left(4, \frac{\pi}{3}\right)$.

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21. In any ABC, prove that: $\frac{\cos A}{a} + \frac{\cos B}{b} + \frac{\cos C}{c} = \frac{a^2 + b^2 + c^2}{2abc}$

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22. Find the general solutions of cos 2x = 1.

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23. In ΔABC, prove that $(b - c)^2\cos^2\left(\frac{A}{2}\right) + (b + c)^2\sin^2\left(\frac{A}{2}\right) = a^2$.

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24. The principal solution of $\sin x = \frac{-1}{2}$ is

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25. Find the value of $\cos^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$

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26. In $\triangle ABC$, if $a = 13, b = 14, c = 15$, then cosB=

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27. In ΔABC, if $\frac{\cos A}{a} = \frac{\cos B}{b}$, then show that it is an isosceles triangle.

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28. The principal solution $\tan x = -\sqrt{3}$ is

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29. Evaluate $\cos\left[\frac{\pi}{6} + \cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)\right]$

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30. If $a\cos A = b\cos B$, prove that the ΔABC is either isosceles or right angled.

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31. In ΔABC, prove that $\frac{\cos 2A}{a^2} - \frac{\cos 2C}{c^2} = \frac{1}{a^2} - \frac{1}{c^2}$

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32. If $\tan^{-1}x + \tan^{-1}y + \tan^{-1}z = \pi$

show that : $\frac{1}{xy} + \frac{1}{yz} + \frac{1}{zx} = 1$

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33. Prove that: $\sin\left\{\frac{\tan^{-1}\left(1 - x^2\right)}{2x} + \frac{\cos^{-1}\left(1 - x^2\right)}{1 + x^2}\right\} = 1$

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34. If in a triangleABC, $\frac{2\cos A}{a} + \frac{\cos B}{b} + \frac{2\cos C}{c} = \frac{a}{bc} + \frac{b}{ca}$

, then prove that the triangle is right angled.

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35. In any ΔABC, prove that : $\frac{a-b}{c} = \frac{\sin, \frac{A-B}{2}}{\cos, \frac{C}{2}}$

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36. If the angles A,B,C of $\triangle ABC$ are in A.P., and its sides a, b, c are in Gp., show that a^2, b^2, c^2 are in A.P.

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37. Prove that $\cot^{-1}7 + 2\cot^{-1}3 = \frac{\pi}{4}$

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38. In any triangle ABC, prove that following:

$$\frac{\cos^2 B - \cos^2 C}{b + c} + \frac{\cos^2 C - \cos^2 A}{c + a} + \frac{\cos^2 A - \cos^2 B}{a + b} = 0$$

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39. Show that : $\frac{\sin^{-1} 3}{5} + \frac{\sin^{-1} 8}{17} = \frac{\cos^{-1} 36}{85}$.

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40. In ΔABC, prove that

$$\frac{a^2 \sin(B - C)}{\sin A} + \frac{b^2 \sin(C - A)}{\sin B} + \frac{c^2 \sin(A - B)}{\sin C} = 0$$

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41. In ΔABC, prove that $\frac{b^2 - c^2}{a}\cos A + \frac{c^2 - a^2}{b}\cos B + \frac{a^2 - b^2}{c}\cos C = 0$

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42. Prove that $2\tan^{-1}\left(\frac{1}{8}\right) + \tan^{-1}\left(\frac{1}{7}\right) + 2\tan^{-1}\left(\frac{1}{5}\right) = \frac{\pi}{4}$

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43. In Δ ABC, if $\angle A = \frac{\pi}{2}$, then prove that $\sin(B - C) = \frac{b^2 - c^2}{b^2 + c^2}$

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44. If $\cos^{-1}x + \cos^{-1}y - \cos^{-1}z = 0$, then show that $x^2 + y^2 + z^2 - 2xyz = 1$

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PAIRS OF LINES

1. The combined equation of two lines passing through origin and each making an angle 45° and 135° with the positive X axis is....

A. $x^2 + y^2 = 0$

B. xy = 1

C. $x^2 - y^2 = 0$

D. $x^2 + xy = 0$

Answer: C

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2. The equation of the lines represented by $3x^2 - 2\sqrt{3}xy - 3y^2 = 0$ are

A. $x + \sqrt{3}y = 0$ and $\sqrt{3}x + y = 0$

B. $x - \sqrt{3}y = 0$ and $\sqrt{3}x - y = 0$

C. $x - \sqrt{3}y = 0$ and $\sqrt{3}x + y = 0$

D. $x + \sqrt{3}y = 0$ and $\sqrt{3}x - y = 0$

Answer: C

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3. The equation $4x^2 + 4xy + y^2 = 0$ represents two......

A. real and distinct lines

B. real and coincident lines

C. imaginary lines

D. perpendicular lines

Answer: B

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4. If the lines represented by $kx^2 - 3xy + 6y^2 = 0$ are perpendicular to each other then.....

A. k = 6

B. k = -6

C. k = 3

D. k = -4

Answer: B

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5. Auxiliary equation of $2x^2 + 3xy - 9y^2 = 0$ is

A. $2m^2 + 3m - 9 = 0$

B. $9m^2 - 3m - 2 = 0$

C. $2m^2 - 3m + 9 = 0$

D. $-9m^2 - 3m + 2 = 0$

Answer: B

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6. The combined equation of the lines through origin and perpendicular to the pair of lines $3x^2 + 4xy - 5y^2 = 0$ is...

A. $5x^2 + 4xy - 3y^2 = 0$

B. $3x^2 + 4xy - 5y^2 = 0$

C. $3x^2 - 4xy + 5y^2 = 0$

D. $5x^2 + 4xy + 3y^2 = 0$

Answer: A

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7. The acute angle between the lines represented by $x^2 + xy = 0$ is....

A. $\frac{\pi}{2}$

B. $\frac{\pi}{4}$

C. $\frac{\pi}{6}$

D. $\frac{\pi}{3}$

Answer: B

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8. If $2x + y = 0$ is one of the lines represented by $3x^2 + kxy + 2y^2 = 0$. Then the value of k is

A. $\frac{1}{2}$

B. $\frac{11}{2}$

C. $\frac{2}{3}$

D. $\frac{3}{2}$

Answer: B

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9. The combined equations of lines passing through $(2, 3)$ and parallel to the co-ordinate axes is

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10. Find the separate equations of the lines given by $x^2 + 2xy\tan \propto - y^2 = 0$

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11. If sum of the slopes of the lines represented by $x^2 + kxy - 3y^2 = 0$ is twice their product, then k=

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12. Find the measure of acute angle between the lines given by $x^2 - 4xy + y^2 = 0$

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13. Find the value of h, if the measure of the angle between the lines $3x^2 + 2hxy + 2y^2 = 0$ is 45°.

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14. The combined equation of lines passing through the point $(-1, 2)$ of which one is parallel to $x + 3y - 1 = 0$ and other is perpendicular to $2x - 3y - 1 = 0$ `is

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15. Find the joint equation of the pair of lines through the origin which are perpendicular to the lines given by $5x^2 + 2xy - 3y^2 = 0.$

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16. If the line $4x + 5y = 0$ coincide with one of the lines given by $ax^2 + 2hxy + by^2 = 0$, then

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17. The acute angle θ between the lines represented by $3x^2 - 4\sqrt{3}xy + 3y^2 = 0$ is

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18. Find the combined equation of the lines 2x + 3y = 0 and x - 2y = 0

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19. Show that a homogeneous equations of degree two in x and y , i.e., $ax^2 + 2hxy + by^2 = 0$ represents a pair of lines passing through the origin if $h^2 - 2ab \geq 0$.

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20. If θ is the acute angle between the lines given by $ax^2 + 2hxy + by^2 = 0$ then prove that $\tan\theta = \left|\frac{2\sqrt{h^2 - ab}}{a + b}\right|$.

Hence find acute angle between the lines $2x^2 + 7xy + 3y^2 = 0$

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21. If the angle between the lines represented by $ax^2 + 2hxy + by^2 = 0$ is equal to the angle between the lines $2x^2 - 5xy + 3y^2 = 0$, then show that $100\left(h^2 - ab\right) = (a + b)^2$.

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VECTOR AND THREE DIMENSIONAL GEOMETRY

1. If $\left|\bar{a}\right| = 3, \left|\bar{b}\right| = 4$, then the value of λ for which $\bar{a} + \lambda\bar{b}$ is perpendicular to $\bar{a}$ - $\lambda\bar{b}$ is.....

A. $\frac{9}{16}$

B. $\frac{3}{4}$

C. $\frac{3}{2}$

D. $\frac{4}{3}$

Answer: B

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2. $\left(\hat{i}+\hat{j}-\hat{k}\right).\left(\hat{i}-\hat{j}+\hat{k}\right)$=__________

A. $\hat{i}-\hat{j}-\hat{k}$

B. 1

C. -1

D. $-\hat{j}+\hat{k}$

Answer: C

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3. The angle θ between two non-zero vectors $\bar{a}$ and $\bar{b}$ is given by $\cos\theta$ =....

A. $\dfrac{\bar{a}.\bar{b}}{|\bar{a}||\bar{b}|}$

B. $\bar{a}.\bar{b}$

C. $|\bar{a}||\bar{b}|$

D. $\dfrac{|\bar{a}||\bar{b}|}{\bar{a}.\bar{b}}$

Answer: A

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4. If the sum of two unit vectors is a unit vector,then find the magnitude of their differences.

A. $\sqrt{2}$

B. $\sqrt{3}$

C. 1

D. 2

Answer: B

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5. If α, β, γ are direction angles of a line and $\alpha = 60^\circ, \beta = 45^\circ$, then γ =________

A. 30° or 90°

B. 45° or 60°

C. 90° or 30°

D. 60° or 120°

Answer: D

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6. The distance of the point (3, 4, 5) from Y-axis is___________

A. 3

B. 5

C. $\sqrt{34}$

D. $\sqrt{41}$

Answer: C

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7. If $\cos\alpha, \cos\beta, \cos\gamma$ are the direction cosines of a line then the value of $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$ is________

A. 1

B. 2

C. 3

D. 4

Answer: B

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8. If $|\bar{a}| = 2, \ |\bar{b}| = 5, \ \text{and} \ \bar{a}.\bar{b} = 8$ then $|\bar{a} - \bar{b}|$ =________

A. 13

B. 12

C. $\sqrt{13}$

D. $\sqrt{21}$

Answer: C

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9. If $\overline{AB} = 2\hat{i} + \hat{j} - 3\hat{k}$, and A(1, 2, -1) is given point then corrdinates of B are_______

A. (3, 3, -4)

B. (-3, 3, -2)

C. (3, 3, 2)

D. (-3, 3, 4)

Answer: A

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10. If l, m, n are direction cosines of a line then $l\hat{i} + m\hat{j} + n\hat{k}$ is________

A. Null vector

B. the unit vector along the line.

C. Any vector along the line

D. a vector perpendicular to the line

Answer: B

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11. The values of c that satisfy $\left|c\bar{u}\right| = 3, \bar{u} = \hat{i} + 2\hat{j} + 3\hat{k}$ is__________

A. $\sqrt{14}$

B. $3\sqrt{14}$

C. $\frac{3}{\sqrt{14}}$

D. 3

Answer: C

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12. The value of c if $\left|c\bar{u}\right| = \sqrt{14}, \bar{u} = \hat{i} + 2\hat{j} + 3\hat{k}$ is__________

A. 0

B. -1

C. 1

D. 3

Answer: C

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13. The two vectors $\hat{j} + \hat{k}$ and $3\hat{i} - \hat{j} + 4\hat{k}$ represent the two sides AB and AC, respectively of a ABC. Find the length of the median through A.

A. $\dfrac{\sqrt{34}}{2}$

B. $\dfrac{\sqrt{48}}{2}$

C. $\sqrt{18}$

D. $\sqrt{34}$

Answer: A

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14. Find the magnitude of a vector with initial point : (1, -3, 4), terminal point : (1, 0, -1).

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15. Find the coordinates of the point which is located, three units behind the YZ-plane, four units to the right of the XZ-plane and five units above the XY-Plane.

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16. A(2, 3), B(-1, 5), C(-1, 1) and D(-7, 5) are four points in the Cartesian plane. Check if, $\overline{CD}$ is parallel to $\overline{AB}$.

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17. Find a unit vector in the opposite direction of $\bar{u}$. Where $\bar{u} = 8\hat{i} + 3\hat{j} - \hat{k}$.

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18. The non zero vectors $\bar{a}$ and $\bar{b}$ are not collinear find the value of λ and μ : if $\bar{a} + 3\bar{b} = 2\lambda\bar{a} - \mu\bar{b}$

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19. If $\bar{a} = 4\hat{i} + 3\hat{k}$ and $\bar{b} = -2\hat{i} + \hat{j} + 5\hat{k}$ then find $2\bar{a} + 5\bar{b}$

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20. Find the distance from (4, -2, 6) to the XZ-Plane.

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21. If the vectors $2\hat{i} - q\hat{j} + 3\hat{k}$ and $4\hat{i} - 5\hat{j} + 6\hat{k}$ are collinear then find the value of q.

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22. Find $\bar{a}.\bar{b} \times \bar{c}$, if $\bar{a} = 3\hat{i} - \hat{j} + 4\hat{k}, \bar{b} = 2\hat{i} + 3\hat{j} - \hat{k}, \bar{c} = -5\hat{i} + 2\hat{j} + 3\hat{k}$

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23. If a line makes angle $90o$, $60o$and $30o$with the positive direction of x, y and z-axis respectively, find its direction cosines.

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24. The vector $\bar{a}$ is directed due north and $\left|\bar{a}\right| = 24$. The vector $\bar{b}$ is directed due west and $\left|\bar{b}\right| = 7$. Find $\left|\bar{a} + \bar{b}\right|$.

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25. Show that following points are collinear P(4, 5, 2), Q(3, 2, 4), R(5, 8, 0)

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26. If a vector has direction angles 45° and 60° find the third direction angle.

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27. If $\bar{c} = 3\bar{a} - 2\bar{b}$ then prove that $\begin{bmatrix} \bar{a} & \bar{b} & \bar{c} \end{bmatrix} = 0$

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28. If $\left|\bar{a}.\bar{b}\right| = \left|\bar{a} \times \bar{b}\right| \& \bar{a}.\bar{b} < 0,$ then find the angle between $\bar{a}$ and $\bar{b}$.

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29. The direction ratios of a vector perpendicular to the two lines whose direction ratios are 1, 3, 2 and -1, 1, 2 are

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30. If $\bar{a}, \bar{b}$ and $\bar{c}$ are position vectors of the points A, B, C respectively and $5\bar{a} - 3\bar{b} - 2\bar{c} = \bar{0}$, then find the ratio in which the point C divides the lines segment BA.

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31. If $\bar{a}$ and $\bar{b}$ are two vectors perpendicular each other, prove that $\left(\bar{a} + \bar{b}\right)^2 = \left(\bar{a} - \bar{b}\right)^2$

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32. Find the position vector of point R which divides the line joining the points P and Q whose position vectors are $2\hat{i} - \hat{j} + 3\hat{k}$ and $-5\hat{i} + 2\hat{j} - 5\hat{k}$ in the ratio 3 : 2

(i) internally

(ii) externally.

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33. Find a unit vector perpendicular to the vectors $\hat{j} + 2\hat{k} \& \hat{i} + \hat{j}$

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34. If two of the vertices of the triangle are A(3, 1, 4) and B(-4, 5, -3) and the centroid of a triangle is G(-1, 2, 1), then find the co-ordinates of the third vertex C of the triangle.

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35. Find the centroid of tetrahedron with vertices K(5, -7, 0), L(1, 5, 3), M(4, -6, 3), N(6, -4, 2) ?

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36. If a line has the direction ratios 4, -12, 18, then its direction cosines are

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37. Show that the points A(2, -1, 0) B(-3, 0, 4), C(-1, -1, 4) and D(0, -5, 2) are non coplanar.

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38. Using properties of scalar triple product, prove that $\left[\bar{a}+\bar{b} \quad \bar{b}+\bar{c} \quad \bar{c}+\bar{a}\right]=2\left[\bar{a} \quad \bar{b} \quad \bar{c}\right]$

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39. The direction ratios of AB are -2,2,1. If $A \equiv (4, 1, 5)$ and l(AB) = 6 units, find coordinates of B.

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40. If G(a,2,-1) is the centroid of the triangle with vertices P(1,3,2),Q(3,b,-4) and R(5,1,c), then find the values of a,b and c.

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41. If $G\left(r, \frac{-4}{3}, \frac{1}{3}\right)$ is centroid of the triangle having vertices $A(5, 1, p), B(1, q, p), C(1, -2, 3)$, then

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42. Prove that an angle inscribed in a semi-circle is a right angle using vector method.

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43. Prove using vectors: Medians of a triangle are concurrent.

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44. Show that the perpendicular bisectors of the sides of a triangle are concurrent.

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45. Express $-\hat{i} - 3\hat{j} + 4\hat{k}$ as the linear combination of the vectors $2\hat{i} + \hat{j} - 4\hat{k}$, $2\hat{i} - \hat{j} + 3\hat{k}$ and $3\hat{i} + \hat{j} - 2\hat{k}$.

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46. If Q be the foot of perpendicular from $P(2, 4, 3)$ on the line joining the points $A(1, 2, 4)$and $B(3, 4, 5)$, then co-ordinate of Q is given by

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47. Prove that the internal bisectors of the angles of a triangle are concurrent

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48. Using vector method, find the incenter of the triangle whose vertices are

A(0,3,0) B (0,0,4) and C (0,3,4)

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49. The angle between the lines whose direction cosines l, m, n satisfy the equations $5l + m + 3n = 0$ and $5mn - 2nl + 6lm = 0$ is

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50. If $A(\bar{a})$ and $B(\bar{b})$ are any two points in the space and $R(\bar{r})$ be a point on the line segment AB dividing it internally in the ratio m : n , then prove that :

$$\bar{r} = \frac{m\bar{b} + n\bar{a}}{m + n}$$

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51. D,E divide sides BC and CA of a triangle ABC in the ratio 2:3 respectively. Find the position vector of the point of intersection of AD and BE and the ratio in which this point divides AD and BE.

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52. D,E divide sides BC and CA of a triangle ABC in the ratio 2:3 respectively. Find the position vector of the point of intersection of AD and BE and the ratio in which this point divides AD and BE.

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53. Find the value of a tetrahedrn whose vertices are A(-1,2,3),B(3,-2,1),C(2,1,3) and D(-1,-2,4).

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54. If four points $A\left(\overline{a}\right), B\left(\overline{b}\right), C\left(\overline{c}\right) \& D\left(\overline{d}\right)$ are coplanar then show that $\left[\overline{a}\,\overline{b}\,\overline{d}\right] + \left[\overline{b}\,\overline{c}\,\overline{d}\right] + \left[\overline{c}\,\overline{a}\,\overline{d}\right] = \left[\overline{a}\,\overline{b}\,\overline{c}\right]$

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LINE AND PLANE

1. The equation of X-axis is

A. x= y=z

B. y=z

C. y=0,z=0

D. x = 0,y=0

Answer: C

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2. If the perpendicular distance of the plane 2x+3y-z= k from the origin is $\sqrt{14}$ units then k=........

A. 14

B. 196

C. $2\sqrt{14}$

D. $\frac{\sqrt{14}}{2}$

Answer: A

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3. The equations of the plane through the points (1,-1,1) , (3,2,4) and parallel to Y axis is .....

A. $3x+2z-1=0$

B. $3x-2z=1$

C. $3x+2z+1$

D. $3x+2z=2$

Answer: B

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4. The Cartesian equationof a line are $3x + 1 = 6y = 2 = 1 - z$. Find the direction ratios and write down its equation in vector form.

A. 2,1,6

B. $2, 1, -6$

C. $2, -1, 6$

D. $-2, 1, 6$

Answer: B

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5. If the planes $2x - my + z = 3$ and $4x - y + 2z = 5$ are parallel then m=

A. -2

B. 2

C. $\frac{-1}{2}$

D. $\frac{1}{2}$

Answer: D

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6. The directions cosines of the normal to the plane $2x - y + 2z = 3$ are

A. $\frac{2}{3}, \frac{-1}{3}, \frac{2}{3}$

B. $\frac{-2}{3}, \frac{1}{3}, \frac{-2}{3}$

C. $2, -1, 2$

D. $-2, 1, -2$

Answer: A::B

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7. The foot of perpendicular drawn from the origin to the plane is $(4, -2, -5)$. Find the equation of the plane.

A. 4x+y+5z=14

B. 4x-2y-5z =45

C. x-2y-5z

D. 4x+y+6z=11

Answer: B

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8. The perpendicular distance of the origin from the plane x-3y+4z=6 is ....

A. 6

B. $\frac{6}{\sqrt{26}}$

C. 36

D. $\frac{1}{\sqrt{26}}$

Answer: B

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9. The coordinates of the foot of perpendicular drawn from the origin to the plane 2x+y-2z=18 are ......

A. (4,2,4)

B. (-4,2,4)

C. (-4,-2,4)

D. (4,2,-4)

Answer: D

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10. Find the Cartesian equations of a plane passing through A (1,2,3) and directions ratios of it's normal are 3,2,5.

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11. Find the directions ratios of the normal to the plane 2x+3y+z=7

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12. Find the vector equations of the line

$$\frac{x}{1} = \frac{y - 1}{2} = \frac{z - 2}{3}$$

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13. Verify if the point having positions vector $4\hat{i} - 11\hat{j} + 2\hat{k}$ lies on the line $\bar{r} = \left(6\hat{i} - 4\hat{j} + 5\hat{k}\right) + \mu\left(2\hat{i} + 7\hat{j} + 3\hat{k}\right)$

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14. Find the Cartesian equations of the line passing through A(1,2,3) and having directions ratios 2,3,7

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15. Find the vector equations of the line passing through the point having positions vector $4\hat{i} - \hat{j} + 2\hat{k}$ and parallel

to the vector $-2\hat{i}-\hat{j}+\hat{k}$

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16. Find the Cartesian equation of the line passing through the points (3,2,1) and (1,3,1)

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17. Find the directions ratios of the line perpendicular to the lines

$$\frac{x-7}{2}=\frac{y+7}{-3}=\frac{z-6}{1} \text{ and } \frac{x+5}{1}=\frac{y+3}{2}=\frac{z-6}{-2}$$

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18. Find the directions cosines of the normal to the plane

$\bar{r}.\left(3\hat{i}+4\hat{k}\right)=5$

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19. If the normal to the plane has directions ratios 2,-1,2 and it's perpendicular distance from origin is 6 find its equations.

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20. Reduce the equations $\bar{r}.\left(3\hat{i}+4\hat{j}+12\hat{k}\right)=8$ to normal form.

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21. If the normal to the plane has directions ratios 2,-1,2 and it's perpendicular distance from origin is 6 find its equations.

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22. Find the perpendicular distance of origin from of the plane $6x - 2y + 3z - 7 = 0$

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23. Find the acute angle between the lines x=y: z=0 and x=0z=0

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24. Find Cartesian equations of the line passing through the point A(2,1,-3) and perpendicular to vectors $\hat{i} + \hat{j} + \hat{k}$ and $\hat{i} + 2\hat{j} - \hat{k}$

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25. Find the vector equations of the line passing through the point having positions vector $-\hat{i} - \hat{j} + 2\hat{k}$ and parallel to the line $\bar{r} = \left(\hat{i} + 2\hat{j} + 3\hat{k}\right) + \mu\left(3\hat{i} + 2\hat{j} + \hat{k}\right), \mu$ is a parameter .

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26. Find the Cartesian equations of the line passing through $(-1, -1, 2)$ and parallel to the line 2x-2=3y+1=6z-2

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27. Find the Cartesian equations of the plane passing through A(7,8,6) and parallel to XY plane.

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28. Find the coordinates of the foot of perpendicular from of the origin to the plane 2x+6y-3z=63.

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29. Find the vector equations of a plane at a distance 6 units from the origin and to which vector $2\hat{i} - \hat{j} + 2\hat{k}$ is normal .

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30. The cartesian equation of the plane passing through the points $(1, 1, 2), (0, 2, 3)$ and $(4, 5, 6)$ is

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31. Find the acute angle between the lines $\frac{x-1}{1} = \frac{y-2}{-1} = \frac{z-3}{2}$ and $\frac{x-1}{2} = \frac{y-1}{1} = \frac{z-3}{1}$

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32. Find the distance between the parallel lines $\frac{x}{2} = \frac{y}{-1} = \frac{z}{2}$ and $\frac{x-1}{2} = \frac{y-1}{-1} = \frac{z-3}{2}$.

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33. Find the equations of the plane passing through the point (7,8,6) and parallel to the plane $\bar{r}.\left(6\hat{i} + 8\hat{j} + 7\hat{k}\right) = 0$

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34. Fiind m, if the lines $\frac{1-x}{3}=\frac{7y-14}{2m}=\frac{z-3}{2}$ and $\frac{7-7x}{3m}=\frac{y-5}{1}=\frac{6-z}{5}$ are at right angles.

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35. Show that the lines $\frac{x+1}{-10}=\frac{y+3}{-1}=\frac{z-4}{1}$ and $\frac{x+10}{-1}=\frac{y+1}{-3}=\frac{z-1}{4}$ intersect each other and find the coordinates of the points of intersection .

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36. A(-2,3,4), B(1,1,2),C(4,-1,0) are three points. Find the Cartesian equations of line AB and show that points A,B,C are collinear.

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37. The vector equation of a line passing through the point $\hat{i} + 2\hat{j} + 3\hat{k}$ and perpendicular to the vectors $\hat{i} + \hat{j} + \hat{k}$ and $2\hat{i} - \hat{j} + \hat{k}$ is

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38. Find the equation of the line parallel to the line passing through (5,7) and (2,3) and having x intercept as

-4.

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39. Find vector equations of the plane passing through A(-2,7,5) and parallel to vectors $4\hat{i} - \hat{j} + 3\hat{k}$ and $\hat{i} + \hat{j} - \hat{k}$.

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40. Find the Cartesian and vector equations of the plane which makes intercepts 1,1,1 on the coordinates axes.

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LINEAR PROGRAMMING PROBLEMS

1. The corner point of the feasible solutions are(0,0) (3,0) (2,1)(0,7/3) the maximum value of Z= 4x+5y is

A. 12

B. 13

C. 35/3

D. 0

Answer: B

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2. The half plane represented by $4x+3y > 14$ contains the point

A. (0,0)

B. (2,2)

C. (3,4)

D. (1,1)

Answer: C

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3. The feasible region is the set of point which satisfy

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4. Objective function of an LPP is

A. A constraint

B. A functions to be maximized or minimized

C. A relation between the decision variable

D. Equations of straight line

Answer: B

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5. The value of objective function is maximum under linear constraints

A. At the centre of the feasible region

B. At (0,0)

C. At vertex of feasible

D. At (-1,-1)

Answer: C

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6. If a corner points of the feasible solutions are (0,10)(2,2) (4,0) (3,2) then the point of minimum Z=3x +2y is

A. (2,2)

B. (0,10)

C. (4,0)

D. (3,2)

Answer: A

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7. The point of which of the maximum value of $z = x + y$ subject to contraints $x + 2y \leq 70, 2x + y \leq 90, x \geq 0, y \geq 0$ is obtained at

A. (30,25)

B. (20,35)

C. (35,20)

D. $\left(\frac{110}{3}, \frac{50}{3}\right)$

Answer: D

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8. Solution set of the inequality $x \geq 0$ is

A. Half plane on the Left of y axis

B. Half plane on the right of y axis excluding the point on y-axis

C. Half plane on the right of y axis including the point on y axis

D. Half plane on the upword of x axis

Answer: C

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9. Which value of x is in the solutions set of inequality

$-2x + y \geq 17$

A. -8

B. -6

C. -4

D. 12

Answer: A::B

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10. The graph of the inequality $3x - 4y \leq 12, x \leq 1, x \geq 0, y \geq 0$ lies in fully in

A. I quadrant

B. II quadrant

C. III quadrant

D. IV quadrant

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11. Solve $4x - 18 \geq 0$ graphically using xy plane

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12. Sketch the graph of inequations $x \geq 5y$ in xoy co-ordinate system

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13. Find the graphical solutions for the system of linear inequations $2x + y \leq 2, x - y \leq 1$

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14. Find the feasible solution of linear inequations $2x + 3y \leq 12, 2x + y \leq 8, x \geq 0, y \geq 0$ by graphically

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15. Solve graphically $x \geq 0, y \geq 0$

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16. Find the solutions set of inequalities $0 \leq x \leq 5, 0 \leq 2y \leq 7$

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17. Find the feasible solutions of in equations $3x + 2y \leq 18, 2x + y \leq 10, X \geq 0Y \geq 0$

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18. Draw the graph of inequalities $x \leq 6, y - 2 \leq 0, x \geq 0, y \geq 0$ and indicate the feasible region

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19. Check the ordered points (1,-1),(2,-1)is a solutions of $2x + 3y - 6 \leq 0$

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20. Show the solutions set of inequations 4x-5y ≤ 20 graphically

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21. Maximize $z = 5x + 2y$ subject to $3x + 5y \leq 15, 5x + 2y \leq 10, x \geq 0, y \geq 0$

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22. Maximize $z = 7x + 11y$ subject to the constraints $3x + 5y \leq 26, 5x + 3y \leq 30, x \geq 0, y \geq 0$

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23. Maximize $z = 10x + 25y$, subject to $x \leq 3, y \leq 3, x + y \leq 5, x \geq 0, y \geq 0.$

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24. Maximize :

$z = 3x + 5y$

Subject to : $x + 4y \leq 24$

$3x + y \leq 21$

$x + y \leq 9$

$x \geq 0, y \geq 0$

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25. Minimize $z = 7x + y$, subject to

$5x + y \geq 5, x + y \geq 3, x \geq 0, y \geq 0.$

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26. Minimize $z = 7x + y$ subjected to $x + 2y \geq 3, x + 4y \geq 4, 3x + y \geq 3, x \geq 0, y \geq 0$

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27. Minimize $z = 2x + 4y$ is subjected to $2x + y \geq 3, x + 2y \geq 6, x \geq 0, y \geq 0$ show that the minimum value of z occurs at more than two points

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28. minimize $z = x + 2y$ subjected to contraints $x + y \geq 5, x \geq 3, x + 2y \geq 6, y \geq 0$ show that the minimum value of z occurs at more than two points

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29. Maximize $z = x + 2y$ subject to contraints $x + y \geq 5, x \geq 3, x + 2y \geq 6, y \geq 0$ is this LPP solvable? Justify your answer

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30. Solve $\min z = x + y$ when the constraints are

$x - y \geq 1$

$x - y \geq 0$

$x \geq 0$

$y \geq 0$

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DIFFERENTIATION

1. Derivative of y= sec $\left(\tan^{-1}x\right)$ at x=1 is ________

A. $\frac{1}{2}$

B. 1

C. $1/\sqrt{2}$

D. $\sqrt{2}$

Answer: C

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2. If $f(x) = \log_x(\log x)$, then find $f'(x) at x = e$

A. 1

B. e

C. $\frac{1}{e}$

D. 0

Answer: C

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3. If $y = 25^{\log_5 \sin x} + 16^{\log_4 \cos x}$ then $\frac{dy}{dx}$ = ____________

A. 1

B. 0

C. 9

D. $\cos x$ - $\sin x$

Answer: B

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4. If $f'(4) = 5, f(4) = 3, g'(6) = 7$ and $R(x) = g[3 + f(x)]$ then $R'(4) =$

A. 35

B. 12

C. $7/5$

D. 105

Answer: A

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5. If $y = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$, then $\frac{dy}{dx}$ =____________

A. $\frac{-2}{1+x^2}$

B. 1

C. $\frac{2}{1+x^2}$

D. $\frac{1}{1+x^2}$

Answer: C

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6. If g(x) is the inverse function of f(x) and $f'(x) = \frac{1}{1+x^4}$, then $g'(x)$ is

A. $\frac{1}{1+[g(x)]^4}$

B. $\frac{4x^3}{1+x^4}$

C. $\frac{1}{1+[g(x)]^3}$

D. $1+[g(x)]^4$

Answer: D

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7. If $\sin^{-1}\left(x^3 + y^3\right) = $ a then $\frac{dy}{dx} = $ ________

A. $\frac{-x}{\cos a}$

B. $\frac{-x^2}{y^2}$

C. $\left(y^2\right)/x^2$

D. $\frac{\sin a}{y}$

Answer: B

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8. If $x = \cos^{-1}(t), y = \sqrt{1 - t^2}$ then $\frac{dy}{dx} = $ ___________

A. t

B. $-t$

C. $-1/t$

D. $1/t$

Answer: A

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9. If $x^2 + y^2$= a then $\dfrac{d^2x}{dy^2}$ = __________

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10. If $x^2 + y^2 = t + 1/t$ and $x^4 + y^4 = t^2 + 1/t^2$ then $\dfrac{dy}{dx}$

=_____________

A. $\frac{1}{x}$

B. - $\frac{y}{x}$

C. $\frac{x}{y^2}$

D. - $\frac{1}{y^2}$

Answer: B

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11. If $x = at^4$

$y = 2at^2$ then $\frac{dy}{dx} =$ _____

A. $1/t$

B. -$1/t$

C. $1/t^2$

D. $-1/t^2$

Answer: C

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12. Differentiate $y = \sqrt{x^2 + 5}$w.r. to x

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13. Differentiate $y = e^{\tan x}$ w.r. to x

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14. If $y = \sin^{-1}\left(2^x\right)$, then $\frac{dy}{dx} =$

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15. If f (x) is odd and differentiable , then f'(x) is

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16. If $y = e^{1 + \log x}$, then: $\frac{dy}{dx}$

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17. If $y = \log\left[\cos\left(x^5\right)\right]$ then find $\frac{dy}{dx}$

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18. $If y = \sqrt{\tan\sqrt{x}}, then \frac{dy}{dx} =$

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19. Find the derivative of the inverse of functions $y = 2x^3 - 6x$ and calculate its value at $x = -2$

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20. Let f(x) $= x^5 + 2x - 3$ find $\left(f^{-1}\right)'(-3)$

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21. If $y = \cos^{-1}\left[\sin\left(4^x\right)\right]$, find $\frac{dy}{dx}$

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22. If $y = \tan^{-1}\left(\sqrt{\frac{1 + \cos x}{1 - \cos x}}\right)$, find $\frac{dy}{dx}$

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23. If $x = \sin\theta, y = \tan\theta$ then find $\frac{dy}{dx}$

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24. Differentiate $\sin^2\left(\sin^{-1}\left(x^2\right)\right)$ w.r.t. to x

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25. If $y = \log\sqrt{\dfrac{1 - \cos\left(\frac{3x}{2}\right)}{1 + \cos\left(\frac{3x}{2}\right)}}$, then $\dfrac{dy}{dx} =$

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26. $y = \log\left[4^{2x}\left(\dfrac{x^2 + 5}{\sqrt{2x^3 - 4}}\right)^{3/2}\right]$, find $\dfrac{dy}{dx}$

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27. Differentiate $\cot^{-1}\left(\frac{\cos x}{1+\sin x}\right)$ w.r. to x

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28. Differentiate $\sin^{-1}\left(\frac{2\cos x+3\sin x}{\sqrt{13}}\right)$ w.r.to x

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29. Differentiate $\tan^{-1}\left(\frac{8x}{1-15x^2}\right)$ w.r.to x

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30. If $\log_5\left(\frac{x^4+y^4}{x^4-y^4}\right)=2$, show that $\frac{dy}{dx}=\frac{12x^3}{13y^2}$

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31. If $y=\sqrt{\cos\theta+\sqrt{\cos\theta+\sqrt{\cos\theta+......\infty}}}$, show that $\frac{dy}{d\theta}=\frac{\sin\theta}{1-2y}$

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32. Find the derivative of $\cos^{-1}x$ w.r.t. to $\sqrt{1-x^2}$

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33. If $x\sin(a+y)+\sin a.\cos(a+y)=0$, then prove that $\frac{dy}{dx}=\frac{\sin^2(a+y)}{\sin a}$

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34. If $y=5^x.x^5.x^5.5^5$, find $\frac{dy}{dx}$

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35. If $y=e^{m\tan^{-1}x}$, show that $\left(1+x^2\right)\frac{d^2y}{dx^2}+(2x-m)\frac{dy}{dx}=0$

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36. If $x^7 . y^5 = (x + y)^{12}$, show that $\frac{dy}{dx} = \frac{y}{x}$

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37. Differentiate $\tan^{-1}\left(\frac{8x}{1 - 15x^2}\right)$ w.r.to $\tan^{-1}\left(\frac{2x\sqrt{1 - x^2}}{1 - 2x^2}\right)$

Watch Video Solution

38. If $y = \sin^{-1}\left(\frac{a\sin x + b\cos x}{\sqrt{a^2 + b^2}}\right)$, then $\frac{dy}{dx} =$

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39. If $y = \cos\left(m\cos^{-1}x\right)$ then show that $\left(1 - x^2\right)\frac{d^2y}{dx^2} - x\frac{dy}{dx} + m^2y = 0$

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40. If y = f(u) is a differentiable functions of u and u = g(x) is a differentiable functions of x such that the composite functions $y = f[g(x)]$ is a differentiable functions of x then $\frac{dy}{dx} = \frac{dy}{du}.\frac{du}{dx}$ Hence find $\frac{dy}{dx}$ if $y = \sin^2x$

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41. Suppose $y = f(x)$ is differentiable functions of x on an interval I and y is one - one, onto and $\frac{dy}{dx} \neq 0$ on I. Also if $f^{-1}(y)$ is differentiable on $f(I)$ then prove that $\frac{dx}{dy} = \frac{1}{dy/dx}, \frac{dy}{dx} \neq 0$

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42. If x = f(t) and y = g(t) are differentiable functions of t so that y is a differentiable functions of x and if $dx/dt \neq 0$ then $\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}}$. Hence find $\frac{dy}{dx}$ if $x = 2\sin t$ and $y = \cos 2t$

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1. The slope of the tangent to the curve x=2 $\sin^3 t, y = 3\cos^3 t$ at $t = \frac{\pi}{4}$ is

A. $\frac{3}{2}$

B. - $\frac{3}{2}$

C. $\frac{2}{3}$

D. - $\frac{2}{3}$

Answer: B

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2. The slope of the normal to the curve $y = x^2 + 2e^x + 2$ at $(0, 4)$ is

A. 2

B. -2

C. $\frac{1}{2}$

D. $-\frac{1}{2}$

Answer: D

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3. If the line y=4x -5 touches the curve $y^2 = ax^3 + b$ at the point (2,3) then a+b is

A. -5

B. 2

C. -7

D. 9

Answer: A

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4. If the tangent at $(1, 1)$ on $y^2 = x(2 - x)^2$ meets the curve again at P, then find coordinates of P.

A. (4,4)

B. $(-1, 2)$

C. $(3, 6)$

D. $\left(\frac{4}{9}, \frac{3}{8}\right)$

Answer: D

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5. The displacement of a particle at time t is given by $s = 2t^3 - 5t^2 + 4t - 3$. The time when the acceleration is 14ft/ $\sec^2$ is

A. $1\sec$

B. $2\sec$

C. $3\sec$

D. 4sec

Answer: B

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6. Let f(x) $= x^3 - 6x^2 + 9x + 18$, then f(x) is strictly decreasing in ....

A. $(-\infty, 1)$

B. $(3, \infty)$

C. $(-\infty, 1)$

D. $(1, 3)$

Answer: D

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7. A ladder 5 m in length is resting against vertical wall. The bottom of the ladder is pulled along the ground away from the wall at the rate of 1.5m/sec. The length of the highest point of the ladder when the foot of the ladder 4.0 m away from the wall decreases at the rate of

A. 1

B. 2

C. 2.5

D. 3

Answer: C

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8. The edge of a cube is decreasing at the rate of $0.6 cm/\sec$ then the rate at which its volume is decreasing when the edge of the cube is 2cm , is

A. $1.2 cm^3/\sec$

B. $3.6 cm^3/\sec$

C. $4.8 cm^3/\sec$

D. $7.2 cm^3/\sec$

Answer: D

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9. A particle moves along the curve $y = 4x^2 + 2$, then the point on the curve at which -y coordinates is changing 8 times as fast as the x-coordinate is

A. $(2, 18)$

B. $(-1, 6)$

C. $(1, 6)$

D. $(0, 2)$

Answer: C

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10. The function f(x) = x log x is minimum at x =

A. e

B. $\frac{1}{e}$

C. 1

D. $-\frac{1}{e}$

Answer: B

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11. Find the slope of tangent to the curve $y = 2x^3 - x^2 + 2$ at $\left(\frac{1}{2}, 2\right)$

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12. The displacement of a particle at time t is given by $s = 2t^3 - 5t^2 + 4t - 3$. Find the velocity when t = 2 sec.

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13. Prove that functions f(x) $= x - \frac{1}{x}, x \in R$ and $x \neq 0$ is increasing functions.

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14. Show that f(x) = x -cos x is increasing for all x.

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15. Show that the functions $f(x) = x^3 + 10x + 7$ for $x \in R$ is strictly increasing

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16. Find the slope of normal to the curve $3x^2 - y^2 = 8$ at the point (2,2)

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17. Find the slope of tangent to the curve $x = \sin\theta$ and $y = \cos 2\theta$ at $\theta = \frac{\pi}{6}$.

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18. The equation of normal to the curve $y = 2x^3 - x^2 + 2$ at $\left(\frac{1}{2}, 2\right)$ is

a) $2x - 4y + 7 = 0$

b) $2x + y - 3 = 0$

c) $x + y = 0$

d).$2x - y + 3 = 0$

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19. A car is moving in such a ways that the distance it covers , is given by the equations $s = 4t^2 + 3t$, where s, is in meters and t is in seconds . What would be the velocity and the accelerations of the car at time t=20 seconds?

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20. A man of 2 metres height walks at a uniform speed of 6 km/hr away from a lamp post of 6 metres high. Find the rate at which the length of his shadow increases.

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21. Water is being poured at the rate of $36 \text{ m}^3/\text{sec}$ in a cylindrical vessel of base radius 3 metres. Find the rate at which water level is rising.

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22. Test whether the function $f(x) = x^3 + 6x^2 + 12x - 5$ is increasing or decreasing for all $x \in R$.

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23. Test whether the following function $f(x) = 2 - 3x + 3x^2 - x^3, x \in R$ is increasing or decreasing.

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24. Find the values of x for which function $f(x) = 2x^3 - 6x^2 + 6x + 24$ is strictly increasing.

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25. Find the points on the curve $y = \sqrt{x - 3}$, where the tangent is perpendicular to the line $6x + 3y - 5 = 0$.

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26. A spherical soap bubble is expanding so that its radius is increasing at the rate of 0.02 cm/sec. At what rate is the surface area increasing when its radius is 5 cm ? (Take $\pi = 3.14$)

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27. The surface area of a spherical balloon is increasing at the rate of $2\frac{cm^2}{\sec}$. At what rate the volume of the balloon is increasing when the radius of the balloon is 6 cm?

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28. A ladder 10 meter long is leaning against a vertical wall. If the bottom of the ladder is pulled horizontally away from the wall at the rate of 1.2 meters per seconds, find how fast the top of the ladder is sliding down the wall when the bottom is 6 meters away from the wall

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29. Find the values of x for which the function $f(x) = x^3 - 6x^2 - 36x + 7$ is strictly increasing.

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30. Find the values of x, for which the function $f(x) = x^3 + 6x^2 - 36x + 6$ is monotonically decreasing.

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31. The profit function P(x) of a firm, selling x items per day is given by P(x)= $(150 - x)x - 1625$. Find the number of items the firm should manufacture to get maximum profit. Find the maximum profit

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32. Divide the number 30 in to two parts such that their product is maximum.

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33. A wire of length 36meters is bent in the form of a rectangle. Find its dimensions if the area of the rectangle is maximum

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34. Find points on the curve given by $y = x^3 - 6x^2 + x + 3$ where the tangents are parallel to the line $y = x + 5$

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35. The volume of the spherical ball is increasing at the rate of 4π cc/sec. Find the rate at which the radius and the surface area are changing when the volume is 288π cc.

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36. The volume of a sphere increase at the rate of $20cm^3/\text{sec}$. Find the rate of change of its surface area when its radius is 5 cm

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37. A man of height 180 cm is moving away from a lamp post at the rate of 1.2 meter per second. If the height of the lamp post is 4.5 meters, find the rate at which

(i) his shadow is lengthening. (ii) the tip of the shadow is moving.

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38. Find the values of x for which $f(x) = 2x^3 - 15x^2 - 144x - 7$ is

(a) Strictly increasing (b) strictly decreasing

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39. Find the local maximum and local minimum value of $f(x) = x^3 - 3x^2 - 24x + 5$

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40. A wire of length 120cm is bent in the form of a rectangle. Find its dimensions if the area of the rectangle is maximum

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41. An open box is to be made out of a piece of a square card board of sides 18 cm by cutting off equal squares from the corners and turning up the sides. Find the maximum volume of the box.

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42. A rectangular sheet of paper has the area 24 sq. meters. The margin at the top and bottom is 75 cm and sides 50 cm each. What are the dimensions of paper if the area of the printed space is maximum ?

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43. A box with a square base is to have an open top. The surface area of the box is 192sq.cm. What should be its dimensions in order that the volume is largest?

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44. A wire of length l is cut into two parts. One part is bent into a circle and the other into a square. Prove that the sum of the areas of the circle and the square is the least, if the radius of the circle is half of the side of the square.

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INDEFINITE INTEGRATION

1. $\int \frac{\sqrt{\tan x}}{\sin x \cos x} dx$

A. $\frac{1}{2}\sqrt{\tan x} + c$

B. $2\sqrt{\tan x} + c$

C. $\sqrt{2}\tan x + c$

D. $\frac{1}{\sqrt{2\tan x}} + c$

Answer: B

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2. $\int \frac{1}{\sqrt{x} + \sqrt{x^3}}dx = ...$

A. $2\tan^{-1}\left(\sqrt{x}\right) + c$

B. $\tan^{-1}(2x - 1) + c$

C. $2\tan\sqrt{x} + c$

D. $2\tan^{-1}(x) + c$

Answer: A

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3. $\int \frac{1}{\sqrt{(x-2)(x-3)}} dx =$

A. $\frac{1}{2}\log\left[(2x-1) + \sqrt{x^2 - x - 6}\right] + c$

B. $\tan^{-1}(2x-1) + c$

C. $\log\left[\left(x - \frac{1}{2}\right) + \sqrt{x^2 - x - 6}\right] + c$

D. $\log\left[\left(x - \frac{1}{2}\right) + \sqrt{x^2 + x + 6}\right] + c$

Answer: C

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4. $\int \frac{1}{\cos x - \sin x} dx = \ldots$

A. $\frac{1}{\sqrt{2}} \log\left[\operatorname{cosec}\left(x + \frac{\pi}{4}\right) - \cot\left(x + \frac{\pi}{4}\right)\right] + c$

B. $\sqrt{2} \log\left[\operatorname{cosec}\left(x + \frac{\pi}{4}\right) + \cot\left(x + \frac{\pi}{4}\right)\right] + c$

C. $\frac{1}{\sqrt{2}} \log\left[\sec\left(x + \frac{\pi}{4}\right) + \tan\left(x + \frac{\pi}{4}\right)\right] + c$

D. $\sqrt{2} \log\left[\sec\left(x + \frac{\pi}{4}\right) - \tan\left(x + \frac{\pi}{4}\right)\right] + c$

Answer: C

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5. $\int \frac{x^2}{\sqrt{1-x^6}} dx = ...$

A. $-\sin^{-1}(x^3) + c$

B. $\cos^{-1}(x^3) + c$

C. $\sin^{-1}(x^3) + c$

D. $\frac{1}{3}\sin^{-1}(x^3) + c$

Answer: D

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6. Evaluate: $\int \frac{e^x}{x} \left\{ x(\log x)^2 + 2\log x \right\} dx$

A. $e^x \log x + c$

B. $e^x(\log x)^2 + c$

C. $e^{2x}\log x + c$

D. $e^{2x}(\log x)^2 + c$

Answer: B

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7. Examples: $\int\sqrt{x^2 + 2x + 5}dx$

A.

$$(x + 1)\sqrt{x^2 + 2x + 5} + \log\left[(x + 1) + \sqrt{x^2 + 2x + 5}\right] + c$$

B.

$$(x + 2)\sqrt{x^2 + 2x + 5} + \log\left[(x + 2) + \sqrt{x^2 + 2x + 5}\right] + c$$

C.

$$\left(\frac{x+2}{2}\right)\sqrt{x^2+2x+5}+\frac{1}{2}\log\left[(x+2)+\sqrt{x^2+2x+5}\right]+c$$

D.

$$\left(\frac{x+1}{2}\right)\sqrt{x^2+2x+5}+2\log\left[(x+1)+\sqrt{x^2+2x+5}\right]+c$$

Answer: D

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8. If $f(x)=\frac{\sin^{-1}x}{\sqrt{1-x^2}}$ and $g(x)=e^{\sin^{-1}x}$, then $\int f(x)g(x)dx$ is equal to

A. $e^{\sin^{-1}x}\left(\sin^{-1}x-1\right)+c$

B. $e^{\sin^{-1}x}\left(1 - \sin^{-1}x\right) + c$

C. $e^{\sin^{-1}x}\left(\sin^{-1}x + 1\right) + c$

D. $-e^{\sin^{-1}x}\left(\sin^{-1}x + 1\right) + c$

Answer: A

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9. $\int \frac{\sin^m x}{\cos^{m+2}x}dx =$

A. $(m + 2)\tan^{m+1}x + c$

B. $\frac{\tan^m x}{m} + c$

C. $(m + 1)\tan^{m+1}x + c$

D. $\frac{\tan^{m+1}x}{m + 1} + c$

Answer: D

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10. $\int \frac{2}{\sqrt{x} - \sqrt{x+3}} dx =$....

A. $-\frac{2}{3}\left[x^{\frac{3}{2}} + (x+3)^{\frac{3}{2}}\right] + c$

B. $\frac{2}{3}\left[x^{\frac{3}{2}} - (x+3)^{\frac{3}{2}}\right] + c$

C. $\frac{4}{9}\left[x^{\frac{3}{2}} - (x+3)^{\frac{3}{2}}\right] + c$

D. $-\frac{4}{9}\left[x^{\frac{3}{2}} + (x+3)^{\frac{3}{2}}\right] + c$

Answer: D

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11. $\int \cos\sqrt{x}dx$=.....

A. $2\left[\sqrt{x}\sin\sqrt{x} + \cos\sqrt{x}\right] + c$

B. $\sqrt{x}\sin\sqrt{x} + 1\cos\sqrt{x} + c$

C. $2\left[\sqrt{x}\cos\sqrt{x} + \sin\sqrt{x}\right] + c$

D. $\frac{1}{2}\left[\sqrt{x}\sin\sqrt{x} - \cos\sqrt{x}\right] + c$

Answer: A

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12. $\int \frac{2\left(\cos^2 x - \sin^2 x\right)}{\cos^2 x + \sin^2 x}dx = ...$

A. $\sin 2x + c$

B. $\cos 2x + c$

C. $\tan 2x + c$

D. $2\sin 2x + c$

Answer: A

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13. $\int \frac{\log x}{(\log ex)^2} dx$=....

A. $x(1 + \log x) + c$

B. $\frac{x}{1 + \log x} + c$

C. $\frac{1}{1 + \log x} + c$

D. $\frac{1}{1 - \log x} + c$

Answer: B

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14. If $\int \frac{1}{x + x^5} dx = f(x) + c$,then the value tof $\int \frac{x^4}{x + x^5} dx$.

A. $f(x) - \log x + c$

B. $f(x) + \log x + c$

C. $\log x - f(x) + c$

D. $\frac{1}{5} x^5 f(x) + c$

Answer: C

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15. 4.Evaluate: $\int e^x \left(\frac{x-1}{x^2}\right) dx$

A. $xe^{-x}+c$

B. $\frac{e^x}{x^2}+c$

C. $\left(x-\frac{1}{x}\right)e^x+c$

D. $\frac{e^x}{x}+c$

Answer: D

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16. $\int \sqrt{1+\sin 2x}\,dx =$

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17. $\int \frac{\sin 4x}{\cos 2x}dx$

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18. Evaluate: $\int \frac{e^{3x}}{e^{3x}+1}dx$

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19. $\int \frac{1}{\sqrt{3x^2+x}}dx$

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20. Evaluate the following Integrals.

$$\int \frac{\log x}{x} dx$$

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21. $\int \left(2 + \cot x - \operatorname{cosec}^2 x\right) e^x dx$

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22. $\int e^x \left[\frac{(x+3)}{(x+4)^2}\right] dx$

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23. $\int \frac{e^{2x} + e^{-2x}}{e^x} dx$

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24. $\int x^x(1 + \log x)dx$

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25. $\int \frac{1}{x\sin^2(\log x)} dx$

Watch Video Solution

26. $\int \sqrt{x}\sec(x)^{\frac{3}{2}}\tan(x)^{\frac{3}{2}}dx$

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27. $\int \frac{\cos 2x}{\sin^2 x}dx$

Watch Video Solution

28. $\int \frac{\cos 2x}{(\sin x + \cos x)^2}dx$ is equal to :

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29. $\int \left(2 + \cot^2 x\right)dx$

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30. $\int \frac{x}{x+2} dx$

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31. $I = \int \frac{\sin x}{1 + \sin x} \cdot dx$

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32. $\int \frac{2x - 7}{\sqrt{4x - 1}} \cdot dx$

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33. $\int \frac{1}{4x + 5x^{-11}} dx$

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34. Evaluate: $\int e^{3\log x}\left(x^4 + 1\right)^{-1} dx$

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35. $\int \frac{\sin(x - a)}{\cos(x + b)} ax$

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36. $\int \cos^7 x dx$

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37. $\int \frac{x^7}{\left(1+x^4\right)^2}dx$

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38. 6. $\int \frac{1}{\sqrt{2x^2-5}} \cdot dx$

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39. Evaluate: $\int \left(\frac{\log(\log x)}{x}\right.dx$

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40. Evaluate: $\int x^2\sqrt{a^6 - x^6}dx$

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41. $\int \sqrt{4^x\left(4^x + 4\right)}dx$

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42. $\int [\cos ec(\log x)][1 - \cot(\log x)]dx$

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43. $\int \frac{\cos 2x}{\sin^2 x \cos^2 x} dx = ?$

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44. $\int \sin 4x \cos 3x dx$

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45. $\int \frac{e^x \log\left(\sin e^x\right)}{\tan\left(e^x\right) dx}$

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46. $\int \frac{1}{x\left(x^3 - 1\right)} dx$

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47. If $f'(x) = x - \frac{3}{x^3}, f(1) = \frac{11}{2}$ find f(x)

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48. $\int \left(\left(x^2 + 2\right)\frac{a^{\left(x + \tan^{-1}x\right)}}{x^2 + 1}\right)$ dx is equal to

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49. $\int \frac{5x^2 + 4x + 7}{\sqrt{(2x + 3)^3}} dx =$

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50. $\int \sqrt{\frac{9 + x}{9 - x}} dx$

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51. $\int \frac{1}{4x^2 - 20x + 17} dx$

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52. Evaluate $\int \frac{\sin x}{\sin 3x} dx$

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53. $\int \frac{1}{2 + \cos x - \sin x} dx$

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54. Evaluate $\int \sec^3 x dx$.

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55. Evaluate: $\int \sin(\log x)\, dx$

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56. $\int \sec^2 x \sqrt{\tan^2 x + \tan x - 7} dx$

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57. $\int e^{\sin^{-1} x} \left(\frac{x + \sqrt{1 - x^2}}{\sqrt{1 - x^2}} \right) dx =$

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58. $\int e^x \frac{\left(1 + x^2\right)}{(1 + x)^2} dx$

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59. $\int \frac{x^2 + x - 1}{x^2 + x - 6} dx$

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60. $\int \frac{6x^3 + 5x^2 - 7}{3x^2 - 2x - 7} dx$

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61. $\int \frac{dx}{2 + 3\tan x}$

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62. Evaluate: $\int\left(\sqrt{\tan x}+\sqrt{\cot x}\right)dx$

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63. Evaluate $\int\frac{3x+4}{\sqrt{2x^{2}+2x+1}}dx$

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64. $\int\sqrt{\frac{e^{3x}-e^{2x}}{e^{x}+1}}dx$

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65. Evaluate :

$\int x^3 \tan^{-1} x dx$

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66. $\int \sin 2x \cos 2x dx$

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67. $\int \frac{x + \sin x}{1 - \cos x} dx$

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68. $\int \frac{x^2}{(x^2+1)(x^2-2)(x^2+3)}dx$

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69. $\int \frac{dx}{(x^3-1)}dx$

Watch Video Solution

70. Evaluate $\int \frac{5e^x}{(e^x+1)(e^{2x}+9)}dx$

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71. $\int \frac{1}{\sin x(3 + 2\cos x)} dx$

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72. Evaluate: $\int x\cos^3 x\, dx$

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73. $\int \frac{\sin 2x}{3\sin^4 x - 4\sin^2 x + 1} dx$

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74. $\int \frac{3e^{2x} + 5}{4e^{2x} - 5} dx =$

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75. $\int \frac{(2\log x + 3)}{x\left[(\log x)^2 + 1\right]}dx$

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DEFINITE INTEGRATION

1. v31

A. $\frac{80}{3}$

B. $\frac{64}{3}$

C. $\frac{17}{3}$

D. $\frac{15}{3}$

Answer: B

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2. $\int_0^1 \sqrt{\frac{1 - x}{1 + x}} dx = ?$

A. $\frac{\pi}{2} - 1$

B. $\frac{\pi}{2} + 1$

C. $\frac{\pi}{2} - 2$

D. $\frac{\pi}{2} + 2$

Answer: A

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3. $\int_1^2 \frac{e^{1/x}}{x^2} dx$

A. $2\sqrt{e}\left(1+\sqrt{e}\right)$

B. $\sqrt{e}\left(1-\sqrt{e}\right)$

C. $\sqrt{e}\left(\sqrt{e}-1\right)$

D. $\sqrt{e}\left(1+\sqrt{e}\right)$

Answer: C

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4. $\int_0^{\frac{\pi}{4}} \sqrt{1+\sin 2x}dx=$

A. $\frac{1}{\sqrt{2}}$

B. $\sqrt{2}+1$

C. $2\sqrt{2}$

D. 1

Answer: D

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5. If $\int_0^1 \frac{dx}{\sqrt{1+x}-\sqrt{x}} = \frac{k}{3}$ then k= ....

A. $\sqrt{2}\left(2\sqrt{2}-2\right)$

B. $\frac{\sqrt{2}}{3}\left(2-2\sqrt{2}\right)$

C. $\frac{2\sqrt{2}-2}{3}$

D. $4\sqrt{2}$

Answer: D

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6. Evaluate $\int_{\pi/5}^{3\pi/10} \frac{\sin x}{(\sin x + \cos x)} dx$.

A. $\frac{\pi}{10}$

B. $\frac{\pi}{20}$

C. $\frac{\pi}{6}$

D. $\frac{\pi}{12}$

Answer: B

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7. Evaluate the following :

$$\int_0^1 \frac{x^2 - 2}{x^2 + 1} dx$$

A. $1 - \frac{3\pi}{4}$

B. $2 - \frac{3\pi}{4}$

C. $1 + \frac{3\pi}{4}$

D. $2 + \frac{3\pi}{4}$

Answer: A

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8. If $I_1 = \int_e^{e^2} \frac{dx}{\log x}$ and $I_2 = \int_1^2 \frac{e^x}{x} dx$, then

A. $I_1 = \frac{1}{3} I_2$

B. $I_1 + I_2 = 0$

C. $I_1 + 2I_2$

D. $I_1 = I_2$

Answer: D

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9. Evaluate the following definite integral: $\int_0^4 \frac{1}{\sqrt{4x - x^2}} dx$

A. 0

B. 2π

C. π

D. 4π

Answer: C

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10. $\int_0^{\pi/2} \log(\cot x)dx =$

A. $\frac{\pi}{8}(\log 2)$

B. 0

C. $-\frac{\pi}{8}(\log 2)$

D. $\frac{\pi}{2}(\log 2)$

Answer: B

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11. Evaluate : $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \cos x dx.$

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12. $\int_{-\pi/4}^{\pi/4} x^3 \sin^4 x dx =$

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13. Evaluate : $\int_0^1 \frac{1}{1+x^2}dx$

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14. Evaluate : $\int_0^{\frac{\pi}{4}} \sec^2 x dx$

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15. Evaluate : $\int_0^1 |x| dx$

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16. Evaluate : $\int_0^1 \frac{-1}{\sqrt{1-x^2}}dx$

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17. Evaluate : $\int_1^2 \frac{x}{1+x^2}dx$

Watch Video Solution

18. Evaluate : $\int_0^1 \frac{e^x}{\sqrt{e^x - 1}}dx$

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19. Evaluate : $\int_0^{\frac{\pi}{2}} \frac{\sin 2x}{1+\sin^2 x}dx$

Watch Video Solution

20. Evaluate : $\int_0^1 (x+1)^2 dx$

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21. Evaluate : $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \sin^2 x dx$

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22. Evaluate : $\int_0^{\pi/2} \sqrt{1 - \cos 4x} dx$

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23. Evaluate : $(i)\int_0^{\pi/2} \cos^3 x dx \ (ii)\int_0^{\pi/2} \sin^4 x dx$

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24. Evaluate : $\int_0^{\pi} \cos^2 x.\, dx$

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25. $\int_0^{\pi/4} \frac{\tan^3 x}{(1 + \cos 2x)} dx$

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26. Evaluate : $\int_0^{\frac{\pi}{4}} \frac{\cos x}{4 - \sin^2 x} dx$

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27. $\int_1^3 \frac{\cos(\log x)}{x} dx$

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28. Evaluate : $\int_0^{\frac{\pi}{2}} \frac{\sin^2 x}{(1 + \cos x)^2} dx$

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29. Evaluate : $\int_0^9 \frac{\sqrt{x}}{\sqrt{x} + \sqrt{9 - x}} dx$

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30. Property 3: $\int_a^b f(x)dx = \int_a^c f(x)dx + \int_c^b f(x)dx$

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31. Prove that $\int_a^b f(x)dx = \int_a^b f(a + b - x)dx$

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32. Prove that $\int_0^a f(x)dx = \int_0^a f(a - x)dx$. Hence find $\int_0^{\frac{\pi}{2}} \sin^2 x dx$

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33. Evaluate $\int 0 \frac{\pi}{2} \frac{\sin^4 x}{\sin^4 x + \cos^4 x} dx$

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34. Evaluate: $\int_3^8 \frac{(11 - x)^2}{x^2 + (11 - x)^2} dx$

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35. Evaluate: $\int_{-1}^{1} |7x - 4| dx$

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36. Evaluate: $\int_{-4}^{2} \frac{1}{x^2 + 4x + 13} dx$

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37. Evaluate: $\int_0^1 \frac{1}{\sqrt{3 + 2x - x^2} dx}$

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38. $\int_0^1 x\tan^{-1}x\,dx =$

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39. $\int_0^{1/\sqrt{2}} \frac{\sin^{-1}x}{\left(1 - x^2\right)^{3/2}}dx = ?$

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40. Evaluate: $\int_0^{\frac{\pi}{4}} \sec^4 x\,dx$

Watch Video Solution

41. Evaluate: $\int_0^{\frac{\pi}{2}} \frac{1}{5+4\cos x} dx$

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42. Solve $\int_0^{\frac{\pi}{2}} \frac{\cos x}{(1+\sin x)(2+\sin x)} dx$

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43. $\int_{-1}^{1} \frac{1}{a^2 e^x + b^2 e^{-2}} dx =$

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44. $\int_0^a \frac{1}{x + \sqrt{a^2 - x^2}} dx$

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45. Evaluate: $\int_0^3 x^2 dx$

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46. $\int_0^1 t^2 \sqrt{1 - t} \cdot dt$

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47. prove that : $\int_0^{2a} f(x)dx = \int_0^a f(x)dx + \int_0^a f(2a - x)dx$

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48. Prove that :

$\int_{-a}^{a} f(x)dx = 2\int_{0}^{a} f(x)dx, \quad \text{if} \quad f(x)$ is even funtion

=0 , if f(x) is off fuction.

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49. Evaluate the following :

$$\int_0^{1/2} \frac{dx}{\left(1 - 2x^2\right)\sqrt{1 - x^2}}$$

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50. Evaluate: $\int_0^{\frac{\pi}{4}} \frac{\sec^2 x}{3\tan^2 x + 4\tan x + 1} dx$

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51. Evaluate: $\int_{\frac{1}{\sqrt{2}}}^{1} \frac{\left(e^{\cos^{-1} x}\right)\left(\sin^{-1} x\right)}{\sqrt{1 - x^2}} dx$

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52. Evaluate $\int_0^1 \frac{\ln(1 + x)}{1 + x^2} dx$

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53. $\int_0^{\pi} x \sin x . \cos^2 x dx$

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54. Evaluate : $\int_0^{\frac{\pi}{2}} x \sin x dx$

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55. $\int_{-1}^{1} \frac{1 + x^3}{9 - x^2} dx =$

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56. Evaluate : $\int_0^1 \left(\frac{1}{1+x^2}\right)\sin^{-1}\left(\frac{2x}{1+x^2}\right)dx$

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57. Evaluate : $\int_0^{\frac{\pi}{4}} \frac{\cos 2x}{\cos 2x + \sin 2x} dx$

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58. $\int_0^{\pi/4} \log(1+\tan x)dx = ?$

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59. Evaluate : $\int_0^{\pi} \frac{1}{3 + 2\sin x + \cos x} dx$

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APPLICATION OF DEFINITE INTEGRATION

1. The area of the region bounded by the curve y = sinx , X-axis and the lines x = 0, $x = 4\pi$ is ...... sq. units.

A. 2

B. 3

C. $\underline{8}$

D. 16

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2. The area of the region bounded by the ellipse $x^2/64 + y^2/100 = 1$, is .... sq. units.

A. 64π

B. $80\underline{\pi}$

C. $\pi/80$

D. 100π

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3. The area bounded by the parabola $y^2 = x$ along the X-axis & the lines x =0 , x= 2 is ...... sq. units.

A. $4/3$

B. $(4\sqrt{2})/\underline{3}$

C. $2/3$

D. $(2\sqrt{2})/3$

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4. The area bounded by the curve $y = x^2$, the line x = 8 and x axis is ......

A. 16 sq. units

B. 64 sq. units

C. 32 sq. units

D. 4 sq. units

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5. The area of the region included between the parabolas $y^2 = 16x$ and $x^2 = 16y$, is given by .... sq.units

A. 256

B. $16/3$

C. $256/3$

D. $64/3$

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6. The area enclosed between the parabola $y^2 = 20x$ and the line y = 2x is ..... sq. units.

A. $20/3$

B. $40/3$

C. $10/3$

D. $50/3$

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7. The area bounded by the parabola $y^2 = 32x$ the X-axis and the latus rectum is .... sq. units

A. $512/\underline{3}$

B. $512/5$

C. 512

D. $64/3$

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8. The area of the region bounded by the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ is

A. $5(\pi - 2)$

B. $((5/2)(\pi - 2))$

C. $(5/3)(\pi - 2)$

D. $(5/4)(\pi - 2)$

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9. The area of triangle ΔABC whose vertices are A(1,1) ,B(2,1) & C(3,3) is ....sq. units.

A. 1

B. 2

C. 3

D. 4

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10. The area enclosed by the line $2x + 3y = 6$ along X-axis & the lines $x = 0$, $x = 3$ is .... sq. units.

A. 1

B. 2

C. 3

D. 4

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11. Find the area bounded by the curve $y^2 = 36x$, the line x = 2 in first quadrant .

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12. Find the area bounded by the curve y = sinx , the lines x = 0 and $x = \pi/2$.

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13. Find the area enclosed between y = cos x and X-axis between the lines $x = \pi/2$ & $x \leq 3\pi/2$

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14. Find the area of the region bounded by the parabola $y^2 = 32x$ and its Latus rectum in first quadrant .

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15. Find the area of the region bounded by the curve $y = x^2$, the X–axis and the given lines x = 0 , x = 3

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16. Find the area of the region bounded by the curve $y^2 = 8x$, the X–axis and the given lines x = 1, x = 3, $y \geq 0$

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17. Find the area of the region bounded by the curve $x^2 = 12y$, the Y−axis and the given lines $y = 2, y = 4, x \geq 0$

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18. Find the area of the ellipse $x^2/1 + y^2/4 = 1$, in first quadrant

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19. Find the area of sector bounded by the circle $x^2 + y^2 = 25$, in the first quadrant.

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20. Using intergration find the area of the region bounded by the line $2y + x = 8$ x -axis and the lines x=2 and x = 4

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21. Find the area between the x-axis and the curve $y = \sin x$ from $x = 0$ to $x = 2\pi$

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22. Find the area of the region bounded by the parabola $x^2 = 4y$ and The X-axis & the line x = 1, x = 4.

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23. Find the area of the region bounded by the parabola $y^2 = 16x$ and the line $x = 4$.

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24. Find the area of the region bounded by the curves $x^2 = 8y, y = 2, y = 4$ and the Y-axis, lying in the first quadrant.

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25. Find the area of the region bounded by the curve y = sin x, the X−axis and the given lines $x = -\pi, x = \pi$

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26. Find the area of the ellipse $\frac{x^2}{64} + \frac{y^2}{36} = 1.$

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27. Find the area of the region bounded by the curves $y^2 = 4ax$ and $x^2 = 4ay.$

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28. Find the area of the region lying between the parabolas $4y^2 = 9x$ and $3x^2 = 16y$.

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29. Find the area bounded by the cirxle $x^2 + y^2 = 16$ and the line y=x in the first quadrant .

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30. Find the area of the region included between $y = x^2 + 5$ and the line $y = x + 7$

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31. Find the area enclosed between the circle $x^2 + y^2 = 9$, along X – axis and the line x = y , lying in the first quadrant.

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32. Find the area enclosed between the circle $x^2 + y^2 = 1$ and the line $x + y = 1$ lying in the first quadrant.

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33. Find the area of the region bounded by the curve $(y - 1)^2 = 4(x + 1)$ and the line y= x-1

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DIFFERENTIAL EQUATIONS

1. Solution of the equation $x\frac{dy}{dx} = y\log y$ is

A. $y = ae^{x}$

B. $y = be^{2x}$

C. $y = be^{-2x}$

D. $y = e^{ax}$

Answer: D

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2. Bacteria increases at the rate proportional to the number of bacteria present. If the original number N doubles in 3 hours, find in how many hours the number of bacteria will by 4N ?

A. 4 hours

B. 6 hours

C. 8 hours

D. 10 hours

Answer: B

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3. The general solution of $\frac{dy}{dx} = e^{-x}$ is

A. $y = e^{x} + c$

B. $y = e^{-x} + c$

C. $y = -e^{-x} + c$

D. $y = e^{x} + c$

Answer: C

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4. The differential equation of $y = Ae^{5x} + Be^{-5x}$ is

A. $\frac{d^2y}{dx^2} = 25y$

B. $\frac{d^2y}{dx^2} = -25y$

C. $\frac{d^2y}{dx^2} = 5y$

D. $y\frac{d^2y}{dx^2} = -5y$

Answer: A

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5. Differential equation of the function $c + 4yx = 0$ is

A. $xy + \frac{dy}{dx} = 0$

B. $x\frac{dy}{dx} + y = 0$

C. $\frac{dy}{dx} - 4xy = 0$

D. $x\frac{dy}{dx} + 1 = 0$

Answer: B

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6. General solution of $y - x\frac{dy}{dx} = 0$

A. 3 log x + $\frac{7}{y} = c$

B. 2 log x + $\frac{3}{y} = c$

C. log x - log y = log c

D. 3 log x + $\frac{2}{x} = c$

Answer: C

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7. The order and degree of $\left(\frac{dy}{dx}\right)^3 - \frac{d^3y}{dx^3} + ye^x$ is

A. 3, 1

B. 1, 3

C. 3, 3

D. 1, 1

Answer: A

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8. The order and degree of $\left(1 + \left(\frac{dy}{dx}\right)^3\right)^{\frac{2}{3}} = 8\frac{d^3y}{dx^3}$ are respectively

A. 3, 1

B. 1, 3

C. 3, 3

D. 1,1

Answer: C

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9. The solution of $\frac{dy}{dx} = 1$ is

A. $x + y = c$

B. $xy = c$

C. $x^2 + y^2 = c$

D. $y - x = c$

Answer: D

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10. The solution of $\frac{dy}{dx} + \frac{x^2}{y^2} = 0$ is

A. $x^3 + y^2 = 7$

B. $x^2 + y^2 = c$

C. $x^3 + y^3 = c$

D. $x + y = c$

Answer: C

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11. Find the differential equation of family of lines making equal intercept on coordinate axes.

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12. Find the general solution of the differential equation $\frac{dy}{dx} = \frac{1+y^2}{1+x^2}$.

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13. Form the differential equation of family of standard circle

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14. The order and degree of the differential equation $e^{\frac{dy}{dx}} + \frac{dy}{dx} = x$ respectively are

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15. $y = \left(c_{1} + c_{2}x\right)e^{x}$

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16. Solve the differential equation :

$\sec^2 x \tan y dx + \sec^2 y \tan x dy = 0$

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17. solve the differential equation $\frac{dy}{dx} = e^{x+y} + x^2 e^y$

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18. Find the differential equation of family of all ellipse whose major axis is twice the minor axis.

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19. Solve the differential equation $\frac{dy}{dx} + y = e^{-x}$

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20. Solve the differential equation $x\frac{dy}{dx} + 2y = x^2 \log x$

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21. Solve $\frac{dy}{dx} = \frac{x + y + 1}{x + y - 1}$ when $x = \frac{2}{3}, y = \frac{1}{3}$

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22. Solve the differential equation $xdx + 2ydy = 0$

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23. $\left(x^2 - yx^2\right)dy + \left(y^2 + xy^2\right)dx = 0$

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24. Solve the following differential equation $\frac{dy}{dx} = x^2y + y$

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25. Find the differential equation by eliminating arbitrary constants from the relation $x^2 + y^2 = 2ax$

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26. Find the differential equation by eliminating arbitrary constants from the relation $y = \left(c_1 + c_2x\right)e^x$

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27. $y = \log x + c$ is a solution of the differential equation $x\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$

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28. Solve : $\frac{dy}{dx} + \frac{2}{x}y = x^2$

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29. Find particular solutions of the following differential equations :

(1) $\left(x - y^2x\right)dx - \left(y = x^2y\right)dy = 0, \text{ when } x = 2, y = 0$

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30. Solution of the differential equation $\frac{dy}{dx} + \frac{x - 2y}{2x - y} = 0$ is

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31. Find the differential equation from the relation $x^2 + 4y^2 = 4b^2$

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32. The population of a town increases at a rate proportional to the population at that time . If the population increases from 40 thousands to 60 thousands in 40 years, What will be the population in another 20 years ? = [Given: $\sqrt{\frac{3}{2}} = 1.2247$]

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33. The rate o growth of bacteria is proportional to the number present . IT intially, there were 1000 bacteria and the number doubles in 1 hours. Find the number of bacteria after $2\frac{1}{2}$ hours . [take $\sqrt{2} = 1.414$]

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34. Solve the following differential equation

$$yx\frac{dy}{dx} = x^2 + 2y^2$$

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35. Solve the following differential equation

$$y\log y\frac{dx}{dy} = \log y - x$$

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36. For the differential equation, find the particular solution

$\frac{dy}{dx} = (4x + y + 1)$, when $y = 1, x = 0$

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37. Solve the following differential equation

$$y^2dx + \left(xy + x^2\right)dy = 0$$

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38. Solve the following differential equation

$$x^2\frac{dy}{dx} = x^2 + xy - y^2$$

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PROBABILITY DISTIBUTIONS

1. Let the p.m.f. of a random variable X be -

$$P(x) = \frac{3 - x}{10} \text{ for } x = -1, 0, 1, 2$$

= 0 otherwise

Then E(X) is ....

A. 1

B. 2

C. 0

D. -1

Answer: C

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2. If the probability that a bomb will hit a target is 60% and if 10 bombs are dropped then find mean and variance.

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3. If X denotes the number obtained on the uppermost face when a fair die is thrown, then E (X) =

A. $\frac{2}{7}$

B. $\frac{7}{2}$

C. 1

D. $\frac{1}{2}$

Answer: B

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4. A random variable X has the following probability distribution

X	2	3	4
P(x)	0.3	0.4	0.3

Then the variance of this distribution is

A. 0.6

B. 0.7

C. 0.77

D. 0.66

Answer: A

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5. For the random variable X , if V(X) = 4 , E(X) = 3 , then $E\left(X^2\right)$ is ...

A. 9

B. 13

C. 12

D. 7

Answer: B

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6. A random variable X takes the values $0, 1, 2, 3, \ldots,$ with prbability $PX(= x) = k(x+1)\left(\frac{1}{5}\right)^x$, where k is a constant, then $P(X = 0)$ is.

A. $\frac{7}{25}$

B. $\frac{16}{25}$

C. $\frac{18}{25}$

D. $\frac{19}{25}$

Answer: B

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7. The p.m.f of a d.r.v. X is P(X = x)

$$= \begin{cases} \dfrac{\left({}^5C_x\right)}{2^5}, \text{ for } & x = 0,1,2,3,4,5 \\ 0, & \text{otherwise} \end{cases}$$

If $a = P(X \leq 2)$ and $b = P(X \geq 3)$ then the relation between a and b is

A. $a < b$

B. $a > b$

C. $a = b$

D. $a + b = 2$

Answer: C

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8. If the p.m.f of a d.r.v. X is P(X=x)

$$= \begin{cases} \frac{x}{n(n+1)}, \text{ for } & x = 0,1,2,3,\ldots,n \\ 0, & \text{otherwise} \end{cases}$$ then E(X) = ...

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9. The p.m.f. of a r.v. X is $P(x) = \begin{cases} \frac{c}{x^3}, x = 1,2,3 \\ 0, \text{ otherwise} \end{cases}$, then E (X) =

A. $\frac{343}{297}$

B. $\frac{294}{251}$

C. $\frac{297}{294}$

D. $\frac{294}{297}$

Answer: B

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10. If a d.r.v. X has the following probability distribution :

X	−2	−1	0	1	2	3
$P(X=x)$	0·1	k	0·2	2k	0·3	k

then P (X = -1) is ......

A. $\frac{1}{10}$

B. $\frac{2}{10}$

C. $\frac{3}{10}$

D. $\frac{4}{10}$

Answer: A

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11. If a $d.r.v.$ X has the following probability distribution:

X	1	2	3	4	5	6	7
$P(X=x)$	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

then k = ...

A. $\frac{1}{7}$

B. $\frac{1}{8}$

C. $\frac{1}{9}$

D. $\frac{1}{10}$

Answer: D

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12. Let X represent the difference between number of heads and number of tails obtained when a coin is tossed 6 times. What are possible values of X?

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13. An urn contains 5 red and 2 black balls. Two balls are drawn at random. X denotes number of black balls drawn. What are possible values of X?

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14. State which of the following are not probability mass function of random variable.Give reasons of your answers.

X	0	1	2
P (X)	0.4	0.4	0.2

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15. State which of the following are not probability mass function of random variable.Give reasons of your answers.

X	0	1	2	3	4
P (X)	0.1	0.5	0.2	-0.1	0.2

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16. State which of the following are not probability mass function of random variable.Give reasons of your answers.

X	0	1	2
P (X)	0.1	0.6	0.3

Watch Video Solution

17. State which of the following are not probability mass function of random variable.Give reasons of your answers.

Y	-1	0	1
P (Y)	0.6	0.1	0.2

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18. Find mean for the following probability distribution

X	0	1	2	3
P(X=4)	$\frac{1}{6}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{6}$

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19. State whether the following is not the probability mass function of random variable. Give reasons for your answer.

X	3	2	1	0	-1
P(X=x)	0.3	0.2	0.4	0	0.05

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20. Find the expected value and variance of r.v. X whose p.m.f. is given below.

X	1	2	3
$P(X=x)$	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{2}{5}$

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21. Find the probability distribution of (i) number of heads in two tosses of a coin. (ii) number of tails in the simultaneous tosses of three corns. (iii) number of heads in four tosses of a com.

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22. The probability distribution of X is as follows:

X	0	1	2	3	4
$P(X=x)$	0·1	k	2k	2k	k

Find k and P $[X < 2]$.

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23. The following probability distribution of r.v. X

X	−3	−2	−1	0	1	2	3
$P(X=x)$	0.05	0.1	0.15	0.20	0.25	0.15	0.1

Find the probability that (i) X is positive. (ii) X is odd

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24. In the p.m.f. of r.v. X

X	1	2	3	4	5
$P(X=x)$	$\frac{1}{20}$	$\frac{3}{20}$	a	$2a$	$\frac{1}{20}$

Find a

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25. Find the probability distribution of the number of successes in two tosses of a die, where a success is defined as number greater than 4 appears on at least one die.

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26. A coin is biased so that the head is 3 times as likely to occur as tail. If the coin is tossed twice, find the probability distribution of number of tails.

Watch Video Solution

27. A random variable X has the following probability distribution:

X	0	1	2	3	4	5	6	7
P(X)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

Determine : (i) k (ii) $P(X < 3)$ (iii) $P(X > 4)$

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28. Find the probability distribution of number of doublets m three throws of a pair of dice.

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29. Find the mean and variance of the number randomly selected from 1 to 15.

Watch Video Solution

30. The p.m.f. of a r.v. X is $P(x) = \begin{cases} \frac{3-x}{10}, x = -1,0,1,2 \\ 0, \text{otherwise} \end{cases}$ then E (X) =

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31. Find the probability distribution of the number of successes in two tosses of a die, where a success is defined as six appears on at least one die.

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32. Let a pair of dice be thrown and the random variable X be the sum of the numbers that appear on the two dice. Find the mean or expectation of X.

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33. Two cards are drawn simultaneously (or successively without replacement) from a well shuffled pack of 52 cards. Find the mean, variance and standard deviation of the number of kings.

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34. Two numbers are selected at random (without replacement) from the first six positive integers. Let X denote the larger of the two numbers obtained. Find E(X).

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35. In a meeting, 70% of the members favour and 30% oppose a certain proposal. A member is selected at random and we take X = 0 if he opposed, and X = 1 if he is in favour. Find E(X) and Var (X).

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36. The following is the c.d.f. of r.v. X

X	−3	−2	−1	0	1	2	3	4
F(x)	0.1	0.3	0.5	0.65	0.75	0.85	0.9	1

Find (i) $P(-1 \le X \le 2)$ (ii) $P(X \le 3/X > 0)$.

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37. A player tosses two coins he wins Rs.10 if 2 heads appears , Rs. 5 if 1 head appears and Rs.2 if no head appears. Find the expected winning amount and variance of winning amount.

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38. From a lot of 30 bulbs which include 6 defectives, a sample of 4 bulbs is drawn at random with replacement. Find the probability distribution of the number of defective bulbs.

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39. Let X denote the sum of the numbers obtained when two fair dice are rolled. Find the variance and standard deviation of X.

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BINOMIAL DISTRIBUTION

1. In a binomial distribution with n= 4 2. P(X=2) =3. P (X=2) ,then the vlaue of p is

A. $\frac{9}{13}$

B. $\frac{4}{13}$

C. $\frac{6}{13}$

D. $\frac{7}{13}$

Answer: A

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2. Given that $X \sim B(n, P)$. If n = 10, P = 0.4 then E(X) = ...

A. 1

B. 2

C. 3

D. 4

Answer: D

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3. For $X \sim B(n, P)$, If v(x) = 2.4 and P = 0.4 then n = ...

A. 10

B. 20

C. 30

D. 40

Answer: A

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4. Given that X ~ B(n=10, p) .If E (x) = 8, find the value of p .

A. 0.4

B. 0.8

C. 0.6

D. 0.7

Answer: B

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5. Bernoulli distribution is a particular case of binomial distribution if n = ...

A. 4

B. 10

C. 2

D. 1

Answer: D

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6. For $X \sim B$ (n,p) and E (X) = 12, Var (X) = 4, then the value of n is

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7. For Bernoulli Distribution , state formula for E(X) and V(X)

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8. For $X \sim B(n, P)$ and $P(X = x) = {}^8C_x(1/2)^x(1/2)^{8-x}$ then state values of n and P

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9. BERNOULLI TRIAL AND BINOMIAL DISTRIBUTION

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10. A die is rolled .IF X denotes the number of positive divisors of the outcome then the range of the random variable X is

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11. A r.v. $X \sim B$ (n, p). If values of mean and variance of X are 18 and 12 respectively, then total number of possible values of X are

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12. Given $X \sim B(n, p)$ if E(X) = 6, Var (X) = 4.2 , find the value of n and p.

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13. If $X \sim B(n, p)$ with $n = 10, p = 0.4$ the $E\left(X^2\right) = ?$

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14. If X ~ B (6,p) and 2. P (x =3) =P(X= 3) =P (X- 2) then find the value of p

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15. Let the p,m f. of r.v X be d

$p(x) + \binom{4}{x}\left(\frac{5}{9}\right)^{x}\left(\frac{4}{9}\right)^{4-x}$, x= 0,1,2,3,4.

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16. A Fair coin is tossed 5 times , find the probability that a) coin shows exactly three times head b) no head.

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17. The probability that a certain kind of component will survive a check test is 0.6 Find the probability that exactly 2 of the next 4 rested componentws suvive.

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18. Find the probability of guessing correctly at least nine out of ten answers in a "true" or "false" objective test.

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19. A fair coin is tossed 8 times. Find the probability that it shows heads

(i) exactly 5 times (March ' 17)

(2) at lest once . (March ' 14- 17)

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20. The probability that a person who undergoes kidney operation will recover is 0.5. Find the probability that of six patients who undergo similar operations. (a) Non will recover. (b) Half of them will recover.

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