MATHS

BOOKS - KUMAR PRAKASHAN KENDRA MATHS (GUJRATI ENGLISH)

ANNUAL EXAMINATION :SAMPLE PAPER

Part A

1. if $F: R \rightarrow Rf(x) = (5 - x^5)^{\frac{1}{5}}$ then $(fof)(x) = \ldots\ldots\ldots$

A. $x^{\frac{1}{5}}$

B. x^5

C. x

D. $5 - x^5$

Answer: D

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2. IF $A = \{1, 2, 3\}$ then match following subsets of $A \times A$ properly

Part-A	Part-B
(I) $R_1 = \{(1, 1)(1, 2), (2, 1)\}$	(A) only symmetric
(II) $R_2 = \{(1, 1)(2, 2), (3, 3), (1, 2), (3, 1)\}$	(B) equivalence
(III) $R_3 = \{(1, 1)(2, 2), (3, 3)\}$	(C) only reflexive

A. $(I) \rightarrow (B), (II) \rightarrow (A), (III) \rightarrow (C)$

B. $(I) \rightarrow (A), (II) \rightarrow (C), (III) \rightarrow (B)$

C. $(I) \rightarrow (C), (II) \rightarrow (B), (III) \rightarrow (A)$

D. $(I) \rightarrow (A), (II) \rightarrow (B), (III) \rightarrow (C)$

Answer: D

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3. If $f: N \rightarrow N, f(x) = 2x + 3$ then ....

A. f is not one -one

B. f is onto

C. $f^{-1}(x) = \dfrac{x-3}{2}$

D. f^{-1} not defined

Answer: D

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4. $\tan^{-1}\left(\dfrac{x}{y}\right) - \tan^{-1}\dfrac{x-y}{x+y}$ is equal to

A. $\dfrac{\pi}{2}$

B. $\dfrac{\pi}{3}$

C. $\dfrac{\pi}{4}$

D. $\dfrac{-3\pi}{4}$

Answer: C

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5. $\sin\left\{\frac{\pi}{3} - \sin^{-1}\left(\frac{-1}{2}\right)\right\} = \ldots\ldots$

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

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

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

D. 1

Answer: D

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6. If $\cos^{-1}\left(\frac{x}{5}\right) + \operatorname{cosec}^{-1}\left(\frac{5}{4}\right) = p\frac{\pi}{2}$ then x=.......

A. 1

B. 3

C. 5

D. 4

Answer: D

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7. If $x = \frac{1}{3}$, then the value of $\cos\left(2\cos^{-1}x + \sin^{-1}x\right)$ = ____

A. $-\sqrt{\frac{8}{9}}$

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

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

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

Answer: A

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8. equal to =.........

A. 1

B. 2

C. -1

D. -2

Answer: C

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9. if $\begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ and $A + A^1 = I$ then $\alpha = \ldots\ldots$

A. No solution

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

C. π

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

Answer: B

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10. If A is a square matrix such that $A^2 = A$ then $(I + A)^2 - 7A$=......

A. I

B. $I - A$

C. A

D. $3A$

Answer: A

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11. If A and B are symmetric matrices of same order , then AB +BA is a ......

A. skew symetric matrix

B. symmetric matrix

C. Zero matrix

D. identify matrix

Answer: B

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12. If the area of the triangle with vertices $(-2, 0)(0, 4)(0, k)$ having 4 sq. units then K=

A. ± 2

B. ± 3

C. $2, 8$

D. $0, 8$

Answer: D

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13. If $A = \begin{bmatrix} 1 & \cos\theta & 1 \\ -\cos\theta & 1 & \cos\theta \\ -1 & -\cos\theta & 1 \end{bmatrix}$ where $0 \leq \theta \leq 2\pi$ then .....

A. Det (A)=0

B. Det (A) $\in (2, \propto)$

C. Det $(A) \in (2, 4)$

D. Det (A) $\in [2, 4]$

Answer: D

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14. If $D = \begin{bmatrix} 0 & i-100 & i-500 \\ 100-i & 0 & 1000-i \\ 500-i & i-1000 & 0 \end{bmatrix}$ then $|D| = \ldots\ldots$

A. 100

B. 500

C. 1000

D. 0

Answer: D

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15. If $f(x) = \left[\left(\frac{1 - \cos kx}{x^2} : x \neq 0\right), (8, x = 0)\right]$ is continues at $x = 0$, then K=......

A. ± 1

B. ± 2

C. ± 3

D. ± 4

Answer: D

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16. If $e^{x} + e^{y} = e^{x+y}$ then $\dfrac{dy}{dx} = \ldots\ldots\ldots$

A. e^{x-y}

B. e^{y-x}

C. $-e^{y-x}$

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

Answer: D

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17. $\dfrac{d}{dx}\left(e^{\tan^{-1}x + \cot^{-1}x}\right) = \ldots\ldots : (x \in R)$

A. 0

B. 1

C. e

D. $e^{\frac{\pi}{2}}$

Answer: A

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18. The interval in which $y = x^2 . e^{-x}$ is increasing is -----

A. $(-\infty, \infty)$

B. $(-2, 0)$

C. $(2, \infty)$

D. $(0, 2)$

Answer: C

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19. The line $y = mx + 1$ is a tangent to the curve $y^2 = 4x$ if the value of m is _____

A. 1

B. 2

C. 3

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

Answer: A

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20. The normal at the point (2,-2) on the curve $3x^2 - y^2 = 8$ is _____

A. $x + y = 0$

B. $x + 2y = -2$

C. $x - 3y = 8$

D. $3x + y = 4$

Answer: D

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21. Approximate value of $(31)^{\frac{1}{5}}$ is ____

A. 2.01

B. 2.1

C. 2.0125

D. 1.9875

Answer: D

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22. $\int_{-1}^{1} \log\left(\frac{2019 - x}{2019 + x}\right) dx = \ldots\ldots\ldots$

A. 0

B. log 2019

C. 1

D. 2. log (2019)

Answer: A

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23. $\int_0^1 \frac{dx}{x+\sqrt{x}} = \ldots\ldots$

A. $\log 2$

B. $\log 3$

C. $-\log 2$

D. log 4

Answer: D

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24. $\int_0^2 x(2-x)^{\frac{3}{2}} dx = \ldots\ldots$

A. $\frac{32\sqrt{2}}{35}$

B. $\frac{54\sqrt{2}}{7}$

C. $\frac{35\sqrt{2}}{32}$

D. $\frac{1}{35\sqrt{2}}$

Answer: A

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25. $\int \sin(\log x) dx = \dots\dots\dots + c$

A. $\frac{x}{2}[\cos(\log x) - \sin(\log x)]$

B. $\frac{x}{2}[\sin(\log x) + \cos(\log x)]$

C. $\frac{x}{2}[\sin(\log x) - \cos(\log x)]$

D. $x[\sin(\log x) - \cos(\log x)]$

Answer: C

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26. $\int \frac{dx}{\sqrt{e^{2x}-1}} = \ldots\ldots + c$

A. $\sin^{-1}(e^x)$

B. $\sec^{-1}(e^x)$

C. $\tan^{-1}(e^x)$

D. $\cot^{-1}(e^x)$

Answer: B

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27. Evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{dx}{1+\sqrt{\tan x}}$

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

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

C. $\frac{\pi}{12}$

D. 0

Answer: C

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28. Choose the correct answers

The value of $\int_0^1 \tan^{-1}\left(\frac{2x-1}{1+x-x^2}\right)dx$ is

A. 1

B. 0

C. -1

D. $\frac{\pi}{4}$

Answer: B

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29. $\int_0^{\frac{2\pi}{3}} \sqrt{1 + \cos 2x} dx = \ldots\ldots\ldots$

A. $-\sqrt{6}$

B. $-\sqrt{3}$

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

D. $\frac{1}{\sqrt{2}\left(4 - \sqrt{3}\right)}$

Answer: D

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30. Area of the regiion bounded by $\frac{x^2}{16} + \frac{y^2}{9} = 4$

A. 12π

B. 24π

C. 48π

D. 64π

Answer: C

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31. Area of the region bounded by the curve $y = \sin x$ and x -axis $-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$ ....

A. 1

B. 2

C. 4

D. π

Answer: B

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32. Smaller area enclosed by the circle $x^2 + y^2 = 4$ and the line $x + y = 2$ is ....

A. $2(\pi - 2)$

B. $\pi - 2$

C. $\pi - 1$

D. $2(\pi - 1)$

Answer: B

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33. The order and degree of differential equation $xy\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 - y\left(\frac{dy}{dx}\right)^3 = 0$ is ....

A. 1 and 2

B. 1 and 3

C. 2 and 2

D. 2 and 1

Answer: D

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34. Verify that the function $y = e^{-3x}$ is a solution of the differential equation

$$\frac{d^2y}{dx^2} + \frac{dy}{dx} - 6y = 0$$

A. $\frac{dy}{dx} - 3y = 0$

B. $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 6y = 0$

C. $\frac{d^2y}{dx^2} - 9y = 0$

D. $\frac{dy}{dx} - 9y = 0$

Answer: C

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35. The number of arbitrary constants in the particular solution of a differential equation of third order are ....

A. 3

B. 2

C. 1

D. 0

Answer: A

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36. Find angle θ between the vectors $\overrightarrow{a} = \hat{i} + \hat{j} - \hat{k}$ and $\overrightarrow{b} = \hat{i} - \hat{j} + \hat{k}$.

A. $\cos^{-1}\frac{1}{3}$

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

C. $-\sin^{-1}\frac{2\sqrt{2}}{3}$

D. $\sin^{-1}\frac{1}{3}$

Answer: C

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37. Find $\left|\vec{a}-\vec{b}\right|$, if two vectors $\vec{a}$ and $\vec{b}$ are such that $\left|\vec{a}\right|=2,\left|\vec{b}\right|=3$ and $\vec{a}\cdot\vec{b}=4.$

A. $\sqrt{3}$

B. $\sqrt{15}$

C. 1

D. $\sqrt{5}$

Answer: D

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38. The value of $\hat{i}.\left(\hat{j}\times\hat{k}\right)+\hat{j}\cdot\left(\hat{i}\times\hat{k}\right)+\hat{k}\cdot\left(\hat{i}\times\hat{j}\right)$ is

A. 0

B. -1

C. 1

D. 3

Answer: C

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39. If $\vec{a}$ and $\vec{b}$, are two collinear vectors, then which of the following are incorrect :

(A) $\vec{b} = \lambda \vec{a}$, for some scalar λ

(B) $\vec{a} = \pm \vec{b}$

(C) the respective components of $\vec{a}$ and $\vec{b}$ are not proportional

(D) both the vectors $\vec{a}$ and $\vec{b}$ have same direction, but different magnitudes.

A. $\vec{b} \ne \lambda \vec{a}, \forall \lambda \in R$

B. $\bar{a} = \bar{b} = \bar{0}$

C. The respective components of $\vec{a}$ and $\vec{b}$ are in proportion .

D. both direction and magnitude of $\vec{a}$ and $\vec{b}$ are different .

Answer: C

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40. If scalar product of vectors $\vec{a}$ with vectors $3\hat{i}-5\hat{k}, 2\hat{i}+7\hat{j}$ and $\hat{i}+\hat{j}+\hat{k}$ are respectively $-1, 6, 5$ then $\vec{a}$ =.........

A. $3\hat{i}+2\hat{k}$

B. $3\hat{i}+\hat{j}+2\hat{k}$

C. $\hat{i}+3\hat{j}+2\hat{k}$

D. $\hat{i}+\hat{j}+\hat{k}$

Answer: A

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41. For two non - zero vectors $\vec{a}$ and $\vec{b}$ $\left|\vec{a}+\vec{b}\right|=\left|\vec{a}\right|$ then vectors $2\vec{a}+\vec{b}$ and $\vec{b}$ are .....

A. parallel

B. perpendicular

C. co-llinear

D. Equal

Answer: B

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42. The coordinates of the foot of the perpendicular drawn from the origin to the plane $2x-3y+4z-6=0$ are ......

A. $\left(\frac{12}{29}, \frac{-18}{29}, \frac{24}{29}\right)$

B. $\left(\frac{12}{\sqrt{29}}, \frac{-18}{\sqrt{29}}, \frac{24}{\sqrt{29}}\right)$

C. $\left(\frac{6}{29}, \frac{-9}{29}, \frac{12}{29}\right)$

D. $\left(\frac{6}{\sqrt{29}}, \frac{-9}{\sqrt{29}}, \frac{12}{\sqrt{29}}\right)$

Answer: A

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43. The angle bet^n two line $\frac{x+3}{3} = \frac{y-1}{5} = \frac{z+3}{4}$ and $\frac{x+1}{1} = \frac{4-y}{-1} = \frac{z-5}{2}$ is ....

A. $\cos^{-1}\left(\frac{8\sqrt{3}}{13}\right)$

B. $\cos^{-1}\left(\frac{8}{5\sqrt{3}}\right)$

C. $\sin^{-1}\left(\frac{8\sqrt{3}}{15}\right)$

D. $\frac{\pi}{2}$

Answer: B

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44. Distance between the two planes $2x+3y+4z-4=0$ and $4x+6y+8z=12$ is ....

A. 2 units

B. 4 units

C. 8 unit

D. $\frac{2}{\sqrt{29}}$ unit

Answer: D

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45. The objective function of a linear programming problem is ....

A. a constant

B. a function to be optimized

C. an inequality

D. a quadratic equation

Answer: B

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46. In the question of maximum value of z = 800 x + 12000 y subject to constraints

$9x + 12y \leq 180, 3x + 4y \leq 60, x + 3y \leq 30, x \geq 30, x \geq 0, y \geq 0.\ldots\ldots.$

is not a point of feasible region .

A. $(20, 0)$

B. $(12, 6)$

C. $(12, 0)$

D. $(0, 15)$

Answer: B

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47. in solving the L.P problem " minimize $z = 6x + 10y$ subject to $x \geq 6, y \geq 2, 2x + y \geq 10, x \geq 0 y \geq 0$ redundant constraints are ....

A. $x \geq 6, y \geq 2$

B. $2x + y \geq 10, x \geq 0, \ \geq 0$

C. $x \geq 6$

D. $x \geq 6, y \leq 0$

Answer: D

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48. Choose the correct answer

The mean of the numbers obtained on throwing a die having written 1 on three faces, 2 on two faces and 5 on one face is

A. 1

B. 2

C. 5

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

Answer: B

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49. E,F are independent events and P(E) $\neq O, P(F) \neq O$, then .... Is false .

A. $P(E/F) = 1 - P(E)$

B. $P(F^1/E) = 1 - P(F/E)$

C. $P(E^1/F^1) = 1 - P(E)$

D. $P(E^1/F^1) = 1 - P(E/F)$

Answer: A

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50. when four letters are inserted in to four covers (one in each)

A = event that only one letters goes to the proper cover .

B = event that exactly three letters go to the proper covers .

C= event that ll letters go to proper covers and

Part-X	Part-Y
(p) P(A)	(a) O
(q) P(B)	(b) $\frac{1}{24}$
(r) P(C)	(c) $\frac{1}{3}$

then ...... is true

A. $p \rightarrow A, q \rightarrow c, r \rightarrow b$

B. $p \rightarrow c, q \rightarrow a, r \rightarrow b$

C. $p \rightarrow c, q \rightarrow a, r \rightarrow a$

D. $p \rightarrow b, q \rightarrow a, r \rightarrow c$

Answer: D

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51. if $F: R \to Rf(x) = \left(5 - x^5\right)^{\frac{1}{5}}$ then $(fof)(x) = \ldots\ldots\ldots$

A. $x^{\frac{1}{5}}$

B. x^5

C. x

D. $5 - x^5$

Answer: D

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52. IF $A = \{1, 2, 3\}$ then match following subsets of $A \times A$ properly

Part-A	Part-B
(I) $R_1 = \{(1, 1) (1, 2), (2, 1)\}$	(A) only symmetric
(II) $R_2 = \{(1, 1) (2, 2), (3, 3), (1, 2), (3, 1)\}$	(B) equivalence
(III) $R_3 = \{(1, 1) (2, 2), (3, 3)\}$	(C) only reflexive

A. $(I) \rightarrow (B), (II) \rightarrow (A), (III) \rightarrow (C)$

B. $(I) \rightarrow (A), (II) \rightarrow (C), (III) \rightarrow (B)$

C. $(I) \rightarrow (C), (II) \rightarrow (B), (III) \rightarrow (A)$

D. $(I) \rightarrow (A), (II) \rightarrow (B), (III) \rightarrow (C)$

Answer: B

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53. If $f : N \rightarrow N, f(x) = 2x + 3$ then ....

A. f is not one -one

B. f is onto

C. $f^{-1}(x) = \frac{x-3}{2}$

D. f^{-1} not defined

Answer: D

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54. $\tan^{-1}\left(\frac{x}{y}\right)-\tan^{-1}\frac{x-y}{x+y}$ is equal to

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

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

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

D. $\frac{-3\pi}{4}$

Answer: C

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55. $\sin\left\{\frac{\pi}{3}-\sin^{-1}\left(-\frac{1}{2}\right)\right\}$ is _____

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

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

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

D. 1

Answer: D

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56. If $\cos^{-1}\left(\frac{x}{5}\right)+\operatorname{cosec}^{-1}\left(\frac{5}{4}\right)=p\frac{\pi}{2}$ then x=.......

A. 1

B. 3

C. 5

D. 4

Answer: D

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57. If $x=\frac{1}{3}$, then the value of $\cos\left(2\cos^{-1}x+\sin^{-1}x\right)$ = ____

A. $-\sqrt{\frac{8}{9}}$

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

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

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

Answer: A

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58. equal to =.........

A. 1

B. 2

C. -1

D. -2

Answer: C

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59. if $\begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ and $A + A^1 = I$ then $\alpha = \dots\dots$

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

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

C. π

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

Answer: B

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60. If A is a square matrix such that $A^2 = A$ then $(I + A)^2 - 7A$=......

A. I

B. $I - A$

C. A

D. $3A$

Answer: A

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61. If A, B are symmetric matrices of same order, then $AB - BA$ is a

A. skew symetric matrix

B. symmetric matrix

C. Zero matrix

D. identify matrix

Answer: B

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62. If the area of the triangle with vertices $(-2, 0)(0, 4)(0, k)$ having 4 sq. units then K=

A. ± 2

B. ± 3

C. $2, 8$

D. $0, 8$

Answer: D

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63. If $A = \begin{bmatrix} 1 & \cos\theta & 1 \\ -\cos\theta & 1 & \cos\theta \\ -1 & -\cos\theta & 1 \end{bmatrix}$ where $0 \leq \theta \leq 2\pi$ then .....

A. Det (A)=0

B. Det (A) $\in (2, \propto)$

C. Det $(A) \in (2, 4)$

D. Det (A) $\in [2, 4]$

Answer: D

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64. If $D = \begin{bmatrix} 0 & i-100 & i-500 \\ 100-i & 0 & 1000-i \\ 500-i & i-1000 & 0 \end{bmatrix}$ then $|D| = \dots\dots$

A. 100

B. 500

C. 1000

D. 0

Answer: D

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65. If $f(x) = \left[\left(\frac{1-\cos kx}{x^2} : x \neq 0\right), (8, x = 0)\right]$ is continues at $x = 0$, then K=......

A. ± 1

B. ± 2

C. ± 3

D. ± 4

Answer: D

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66. If $e^x + e^y = e^{x+y}$ then $\frac{dy}{dx} = \ldots\ldots\ldots$

A. e^{x-y}

B. e^{y-x}

C. $-e^{y-x}$

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

Answer: D

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67. $\frac{d}{dx}\left(e^{\tan^{-1}x+\cot^{-1}x}\right) = \ldots\ldots\ldots:(x \in R)$

A. 0

B. 1

C. e

D. $e^{\frac{\pi}{2}}$

Answer: A

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68. The interval in which $y = x^2 . e^{-x}$ is increasing is -----

A. $(-\infty, \infty)$

B. $(-2, 0)$

C. $(2, \infty)$

D. $(0, 2)$

Answer: C

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69. If the line y = mx + 1 is tangent to the parabola $y^2 = 4x$ then find the value of m.

A. 1

B. 2

C. 3

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

Answer: A

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70. The normal at the point (2,-2) on the curve $3x^2 - y^2 = 8$ is _____

A. $x + y = 0$

B. $x + 2y = -2$

C. $x - 3y = 8$

D. $3x + y = 4$

Answer: D

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71. Approximate value of $(31)^{\frac{1}{5}}$ is ____

A. 2.01

B. 2.1

C. 2.0125

D. 1.9875

Answer: D

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72. $\int_{-1}^{1} \log\left(\frac{2019 - x}{2019 + x}\right) dx = \ldots\ldots\ldots$

A. 0

B. log 2019

C. 1

D. 2. log (2019)

Answer: A

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73. $\int_0^1 \frac{dx}{x+\sqrt{x}} = \ldots\ldots$

A. $\log 2$

B. $\log 3$

C. $-\log 2$

D. log 4

Answer: D

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74. $\int_0^2 x(2-x)^{\frac{3}{2}} dx = \ldots\ldots$

A. $\frac{32\sqrt{2}}{35}$

B. $\frac{54\sqrt{2}}{7}$

C. $\frac{35\sqrt{2}}{32}$

D. $\frac{1}{35\sqrt{2}}$

Answer: A

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75. $\int \sin(\log x)dx = \dots\dots\dots + c$

A. $\frac{x}{2}[\cos(\log x) - \sin(\log x)]$

B. $\frac{x}{2}[\sin(\log x) + \cos(\log x)]$

C. $\frac{x}{2}[\sin(\log x) - \cos(\log x)]$

D. $x[\sin(\log x) - \cos(\log x)]$

Answer: C

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76. $\int \frac{dx}{\sqrt{e^{2x} - 1}} = \dots\dots + c$

A. $\sin^{-1}(e^x)$

B. $\sec^{-1}(e^x)$

C. $\tan^{-1}(e^x)$

D. $\cot^{-1}(e^x)$

Answer: B

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77. Evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{dx}{1+\sqrt{\tan x}}$

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

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

C. $\frac{\pi}{12}$

D. 0

Answer: C

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78. Choose the correct answers

The value of $\int_0^1 \tan^{-1}\left(\frac{2x-1}{1+x-x^2}\right)dx$ is

A. 1

B. 0

C. -1

D. $\frac{\pi}{4}$

Answer: B

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79. $\int_0^{\frac{2\pi}{3}} \sqrt{1+\cos 2x}dx = \dots\dots\dots$

A. $-\sqrt{6}$

B. $-\sqrt{3}$

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

D. $\frac{1}{\sqrt{2}\left(4-\sqrt{3}\right)}$

Answer: D

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80. Area of the regiion bounded by $\frac{x^2}{16}+\frac{y^2}{9}=4$

A. 12π

B. 24π

C. 48π

D. 64π

Answer: C

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81. Area of the region bounded by the curve $y = \sin x$ and x -axis $-\frac{\pi}{2} \le x \le \frac{\pi}{2}$ ....

A. 1

B. 2

C. 4

D. π

Answer: B

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82. Smaller area enclosed by the circle $x^2 + y^2 = 4$ and the line $x + y = 2$ is ....

A. $2(\pi - 2)$

B. $\pi - 2$

C. $\pi - 1$

D. $2(\pi - 1)$

Answer: B

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83. The order and degree of differential equation $xy\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 - y\left(\frac{dy}{dx}\right)^3 = 0$ is ....

A. 1 and 2

B. 1 and 3

C. 2 and 2

D. 2 and 1

Answer: D

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84. Verify that the function $y = e^{-3x}$ is a solution of the differential equation

$$\frac{d^2y}{dx^2} + \frac{dy}{dx} - 6y = 0$$

A. $\frac{dy}{dx} - 3y = 0$

B. $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 6y = 0$

C. $\frac{d^2y}{dx^2} - 9y = 0$

D. $\frac{dy}{dx} - 9y = 0$

Answer: C

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85. The number of arbitrary constants in the particular solution of a differential equation of third order are ....

A. 3

B. 2

C. 1

D. 0

Answer: A

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86. Find angle θ between the vectors $\vec{a} = \hat{i} + \hat{j} - \hat{k}$ and $\vec{b} = \hat{i} - \hat{j} + \hat{k}$.

A. $\cos^{-1}\frac{1}{3}$

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

C. $-\sin^{-1}\frac{2\sqrt{2}}{3}$

D. $\sin^{-1}\frac{1}{3}$

Answer: C

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87. Find $\left|\vec{a}-\vec{b}\right|$, if two vectors $\vec{a}$ and $\vec{b}$ are such that $\left|\vec{a}\right|=2, \left|\vec{b}\right|=3$ and $\vec{a}\cdot\vec{b}=4.$

A. $\sqrt{3}$

B. $\sqrt{15}$

C. 1

D. $\sqrt{5}$

Answer: D

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88. The value of $\hat{i}.\left(\hat{j}\times\hat{k}\right)+\hat{j}\cdot\left(\hat{i}\times\hat{k}\right)+\hat{k}\cdot\left(\hat{i}\times\hat{j}\right)$ is

A. 0

B. -1

C. 1

D. 3

Answer: C

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89. If $\overrightarrow{a}$ and $\overrightarrow{b}$ are two non- zero collinear vectors then ...... is correct .

A. $\overrightarrow{b} \neq \lambda \overrightarrow{a}, \forall \lambda \in R$

B. $\bar{a} = \bar{b} = \bar{0}$

C. The respective components of $\overrightarrow{a}$ and $\overrightarrow{b}$ are in proportion .

D. both direction and magnitude of $\overrightarrow{a}$ and $\overrightarrow{b}$ are different .

Answer: C

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90. If scalar product of vectors $\overrightarrow{a}$ with vectors $3\hat{i} - 5\hat{k}, 2\hat{i} + 7\hat{j}$ and $\hat{i} + \hat{j} + \hat{k}$ are respectively $-1, 6, 5$ then $\overrightarrow{a}$ =.........

A. $3\hat{i} + 2\hat{k}$

B. $3\hat{i} + \hat{j} + 2\hat{k}$

C. $\hat{i} + 3\hat{j} + 2\hat{k}$

D. $\hat{i} + \hat{j} + \hat{k}$

Answer: A

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91. For two non - zero vectors $\vec{a}$ and $\vec{b} \left|\vec{a} + \vec{b}\right| = \left|\vec{a}\right|$ then vectors $2\vec{a} + \vec{b}$ and $\vec{b}$ are .....

A. parallel

B. perpendicular

C. co-llinear

D. Equal

Answer: B

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92. The coordinates of the foot of the perpendicular drawn from the origin to the plane $2x - 3y + 4z - 6 = 0$ are ......

A. $\left(\frac{12}{29}, \frac{-18}{29}, \frac{24}{29}\right)$

B. $\left(\frac{12}{\sqrt{29}}, \frac{-18}{\sqrt{29}}, \frac{24}{\sqrt{29}}\right)$

C. $\left(\frac{6}{29}, \frac{-9}{29}, \frac{12}{29}\right)$

D. $\left(\frac{6}{\sqrt{29}}, \frac{-9}{\sqrt{29}}, \frac{12}{\sqrt{29}}\right)$

Answer: A

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93. The angle bet^n two line $\frac{x+3}{3} = \frac{y-1}{5} = \frac{z+3}{4}$ and $\frac{x+1}{1} = \frac{4-y}{-1} = \frac{z-5}{2}$ is ....

A. $\cos^{-1}\left(\frac{8\sqrt{3}}{13}\right)$

B. $\cos^{-1}\left(\frac{8}{5\sqrt{3}}\right)$

C. $\sin^{-1}\left(\frac{8\sqrt{3}}{15}\right)$

D. $\frac{\pi}{2}$

Answer: B

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94. Distance between the two planes $2x + 3y + 4z - 4 = 0$ and $4x + 6y + 8z = 12$ is ....

A. 2 units

B. 4 units

C. 8 unit

D. $\frac{2}{\sqrt{29}}$ unit

Answer: D

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95. The objective function of a linear programming problem is ....

A. a constant

B. a function to be optimized

C. an inequality

D. a quadratic equation

Answer: B

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96. In the question of maximum value of z = 800 x + 12000 y subject to constraints

$9x + 12y \leq 180, 3x + 4y \leq 60, x + 3y \leq 30, x \geq 30, x \geq 0, y \geq 0.\dots\dots.$

is not a point of feasible region .

A. $(20, 0)$

B. $(12, 6)$

C. $(0, 10)$

D. $(0, 15)$

Answer: D

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97. in solving the L.P problem " minimize $z = 6x + 10y$ subject to $x \geq 6, y \geq 2, 2x + y \geq 10, x \geq 0y \geq 0$ redundant constraints are ....

A. $x \geq 6, y \geq 2$

B. $2x + y \geq 10, x \geq 0, \ \geq 0$

C. $x \geq 6$

D. $x \geq 6, y \leq 0$

Answer: D

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98. The mean of the numbers obtained on throwing a die having written ,1 on three faces , 2 on two faces and 5 on one face is ....

A. 1

B. 2

C. 5

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

Answer: B

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99. E,F are independent events and P(E) $\neq O, P(F) \neq O$, then .... Is false .

A. $P(E/F) = P(E)$

B. $P\left(F^1/E\right) = 1 - P(F/E)$

C. $P(E^1/F^1) = 1 - P(E)$

D. $P(E^1/F^1) = 1 - P(E/F)$

Answer: A

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100. when four letters are inserted in to four covers (one in each)

A = event that only on letters goes to the proper cover .

B = event that exactly three letters go to the proper covers .

C= event that ll letters go to proper covers and

Part-X	Part-Y
(p) P(A)	(a) O
(q) P(B)	(b) $\frac{1}{24}$
(r) P(C)	(c) $\frac{1}{3}$

then ...... is true

A. $p \rightarrow A, q \rightarrow c, r \rightarrow b$

B. $p \rightarrow c, q \rightarrow a, r \rightarrow b$

C. $p \rightarrow c, q \rightarrow a, r \rightarrow a$

D. $p \rightarrow b, q \rightarrow a, r \rightarrow c$

Answer: D

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Part B Section A

1. Prove that :

$$\tan^{-1}\sqrt{x} = \frac{1}{2}\cos^{-1}\left(\frac{1-x}{1+x}\right), x \in [0, 1]$$

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2. Differentiate $\frac{\sqrt{(x-3)(x^2+4)}}{\sqrt{(3x^2+4x+5)}}$ w.r.t x.

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3. find $\int \frac{(x+1)(x+\log x)^2}{x} dx$

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4. find the area of the region bounded by the two parabolas $y = x^2$ and $y^2 = x$.

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5. Find the area bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and the cordinates $x = 0$ and $x = ae$, where $b^2 = a^2(1 - e^2)$ and $e < 1$.

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6. Find the area of the region bounded by curve $y = 4x^2$ and lines $y = 1, y = 4.$

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7. If a unit vector $\overrightarrow{a}$ makes angles $\frac{\pi}{3}$ with $\hat{i}$, $\frac{\pi}{4}$ with $\hat{j}$ and an acute angle θ with $\hat{k}$ then find θ and hence , the components of $\overrightarrow{a}$.

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8. Find the coordinates of the point where the line through the points A (3, 4, 1) and B (5, 1, 6) crosses the XY-plane.

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9. Three cards are drawn successively, without replacement from a pack of 52 well shuffled cards. What is the probability that first two cards are kings and the third card drawn is an ace?

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10. Events A and B are such that $P(A)=\frac{1}{2}, P(B)=\frac{7}{12}$ and $\mathrm{P(not\ A\ or\ not\ B)}=\frac{1}{4}$. State whether A and B are independent ?

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11. Prove that :

$\tan^{-1}\sqrt{x}=\frac{1}{2}\cos^{-1}\left(\frac{1-x}{1+x}\right), x\in[0,1]$

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12. Differentiate $\frac{\sqrt{(x-3)(x^2+4)}}{\sqrt{(3x^2+4x+5)}}$ w.r.t x.

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13. find $\int \frac{(x+1)(x+\log x)^2}{x} dx$

Watch Video Solution

14. find the area of the region bounded by the two parabolas $y=x^2$ and $y^2=x$

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15. Find the area bounded by the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ and the cordinates $x=0$ and $x=ae$, where $b^2=a^2(1-e^2)$ and $e<1$.

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16. Find the area of the region bounded by curve ` y= 4x^2 ' and st. line y=1 ,y=4.

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17. If a unit vector $\vec{a}$ makes angles $\frac{\pi}{3}$ with $\hat{i}$, $\frac{\pi}{4}$ with $\hat{j}$ and an acute angle θ with $\hat{k}$ then find θ and hence , the components of $\vec{a}$.

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18. Find the coordinates of the point where the line through the points A (3, 4, 1) and B (5, 1, 6) crosses the XY-plane.

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19. Three cards are drawn successively, without replacement from a pack of 52 well shuffled cards. What is the probability that first two cards are kings and the third card drawn is an ace?

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20. Events A and B are such that $P(A) = \frac{1}{2}, P(B) = \frac{7}{12}$ and $\text{P(not A or not B)} = \frac{1}{4}$. State whether A and B are independent ?

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Part B Section B

1. Consider $f: R^{+} \to [4, \infty]$ given by $f(x) = x^2 + 4$ show that f is f invertible with the inverse f^{-1} of given by $f^{-1}(y) = \sqrt{y-4}$ where R^{+} is set of all non - negative real numbers .

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2. Solve following system using matrix

$x - y + 2z = 1, 2y - 3z = 1, 3x - 2y + 4z = 2$

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3. if $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ then prove that $A^n = \begin{bmatrix} 1+2n & -4n \\ n & 1-2n \end{bmatrix}$ where n is any positive integer .

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4. If $x\sqrt{1+y} + y\sqrt{1+x} = 0$, for $-1 < x < 1$, prove that $\frac{dy}{dx} = -\frac{-1}{(1+x)^2}$

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5. Find the vector equation of the plane passing through the intersection of the planes

$\vec{r} \cdot \left(\hat{i} + \hat{j} + \hat{k}\right) = 6$ and $\vec{r} \cdot \left(2\hat{i} + 3\hat{j} + \hat{k}\right) = -5$ and the point $(1, 1, 1)$.

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6. Find the vector equation of the line passing through the point $(1, 2, -4)$ and perpendicular to the two lines $\frac{x-8}{3} = \frac{y+19}{-16} = \frac{z-10}{7}$ and $\frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}$

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7. The corner points of the bounded feasible region for L.P problem are A (0,4) ,B (0,5) , C(3,5) , D(5,3) , E(5,0) ,F(4,0)` . Obtain the maximum and minimum value of the objective function z=10 x -7y +1900 .

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8. If a fair coin is tossed 10 times, find the probability of

(i) exactly six heads

(ii) at least six heads

(iii) at most six heads

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9. Consider $f: R^+ \rightarrow [4, \infty]$ given by $f(x) = x^2 + 4$ show that f is f invertible with the inverse f^{-1} of given by $f^{-1}(y) = \sqrt{y-4}$ where R^+ is set of all non - negative real numbers .

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10. Solve following system using matrix

$x - y + 2z = 1, 2y - 3z = 1, 3x - 2y + 4z = 2$

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11. if $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ then prove that $A^n = \begin{bmatrix} 1+2n & -4n \\ n & 1-2n \end{bmatrix}$ where n is any positive integer .

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12. If $x\sqrt{1+y}+y\sqrt{1+x}=0$, for $-1<x<1$, prove that $\frac{dy}{dx}=-\frac{-1}{(1+x)^2}$

Watch Video Solution

13. Find the vector equation of the plane passing through the intersection of the planes $\vec{r}.\left(\hat{i}+\hat{j}+\hat{k}\right)=6$ and $\vec{r}.\left(2\hat{i}+3\hat{j}+4\hat{k}\right)=-5$ and the points (1,1,1).

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14. Find the vector equation of the line passing through the point $(1, 2, -4)$ and perpendicular to the two lines $\frac{x-8}{3}=\frac{y+19}{-16}=\frac{z-10}{7}$ and $\frac{x-15}{3}=\frac{y-29}{8}=\frac{z-5}{-5}$

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15. The corner points of the bounded feasible region for L.P problem are A (0,4) ,B (0,5) , C(3,5) , D(5,3) , E(5,0) ,F(4,0)` . Obtain the maximum and minimum value of the objective function z=10 x -7y +1900

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16. If a fair coin is tossed 10 times, find the probability of

(i) exactly six heads

(ii) at least six heads

(iii) at most six heads

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Part B Section C

1. show that

$$\begin{bmatrix} (x+y)^2 & zx & zy \\ zx & (z+y)^2 & xy \\ zy & xy & (z+x)^2 \end{bmatrix} = 2xyz(x+y+z)^3$$

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2. An open topped box is to be constructed by removing equal squares from each corner of a 3 metre by 8 metre reactangular sheet of aluminimum and folding up the sides . Find the volume of the largest such box .

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3. Show that the height of the cylinder of maximum volume that can be inscribed in a sphere of radius R is $\frac{2R}{\sqrt{3}}$. Also find the maximum volume.

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4. Evaluate $\int_0^{\frac{\pi}{2}} \log \sin x dx$

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5. The temperature of a body in a a room is 80° C After five minutes the temperature of the body becomes $64^\circ C$ and 10 minutes the temperature becomes $52^\circ C$. What is the temperature of surrounding ? (Newton's law of cooling)

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6. show that

$$\begin{bmatrix} (x+y)^2 & zx & zy \\ zx & (z+y)^2 & xy \\ zy & xy & (z+x)^2 \end{bmatrix} = 2xyz(x+y+z)^3$$

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8. Show that the height of the cylinder of maximum volume that can be inscribed in a sphere of radius R is $\frac{2R}{\sqrt{3}}$. Also find the maximum volume.

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9. Evaluate $\int_0^{\frac{\pi}{2}} \log \sin x dx$

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10. The temperature of a body in a a room is 80° F After five minutes the temperature of the body becomes $60^\circ F$. After another 5 minutes the temperature becomes $50^\circ F$. What is the temperature of surrounding ? (Newton's law of cooling)

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