MATHS

BOOKS - ACCURATE PUBLICATION

SAMPLE QUESTION PAPER - I

Section A Mcq

1. Let $f: R \to R$ be defined as $f(x) = 3x$. Choose the correct answer.

A. f is one - one onto

B. f is many one onto

C. f is one - one but not onto

D. f is neither one - one nor onto

Answer: A

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2. Find the Principle value of $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$

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

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

C. $-\frac{\pi}{3}$

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

Answer: C

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3. If AB = C where A is a matrix of order 2×3 and C is a matrix of order 2×5, then the order of B is :

A. 3×5

B. 4×5

C. 3×3

D. 5×5

Answer: A

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4. Which of the given values of x and y make the following pair of matrices equal

$$\begin{bmatrix} 3x+7 & 5 \\ y+1 & 2-3x \end{bmatrix}, \begin{bmatrix} 0 & y-2 \\ 8 & 4 \end{bmatrix}$$

A. $x = \frac{-1}{3}, y = 7$

B. Not possible to find

C. $y = 7, x = \frac{-2}{3}$

D. $x = \frac{-1}{3}, y = \frac{-2}{3}$

Answer: B

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5. If $A = \begin{pmatrix} \alpha & 3 \\ 3 & \alpha \end{pmatrix}$ and $|A|^3 = -125$, then α equals :

A. ± 1

B. ± 2

C. ± 3

D. ± 4

Answer: B

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6. If function defined by : $f(x) = \begin{cases} \frac{\sin 3x}{4x} & x \neq 0 \\ k+1 & x = 0 \end{cases}$ is continuous at x = 0, then value of k is :

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

B. $-\frac{1}{2}$

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

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

Answer: D

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7. If $y = n^x, n > 0$ then $\frac{dy}{dx}$ is equal to

A. xn^{x-1}

B. $\frac{x}{\log n}$

C. $n^x \log n$

D. None of these

Answer: C

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8. The derivative of $f(x) = |x|$ at $x = 2$ equals

A. 1

B. -1

C. 0

D. 2

Answer: A

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9. $\int \frac{\sin^2 x - \cos^2 x}{\sin^2 x \cos^2 x} dx$ is equal to :

A. $\tan x + \cot x + C$

B. $\tan x + \operatorname{cosec} x + C$

C. $-\tan x + \cot x + C$

D. $\tan x + \sec x + C$

Answer: A

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10. $\int e^x(\cot x + \log \sin x)dx$ is equal to :

A. $e^x \cot x + c$

B. $e^x \log \sin x + c$

C. $e^x + \cot x + c$

D. None of these

Answer: B

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11. The number of arbitrary constants in the particular solution of a differental equation of fourth order is :

A. 0

B. 2

C. 3

D. 5

Answer: A

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12. I.F. factor of $\frac{dy}{dx} + \frac{1}{x \log x} y = \frac{1}{x}$ is

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

B. x^2

C. x^3

D. $\log x$

Answer: D

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13. If $\sqrt{2}\left(\vec{a} \cdot \vec{b}\right) = \left|\vec{a}\right|\left|\vec{b}\right|$, then angle between $\vec{a}$ and $\vec{b}$ is equal to :

A. 30°

B. 45°

C. 60°

D. 90°

Answer: B

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14. Let the vectors a and b be such that $|a| = 3, |b| = \frac{\sqrt{2}}{3}$ and $a \times b$ is a unit vector, then find the angle between a and b.

A. $\pi/6$

B. $\pi/4$

C. $\pi/3$

D. $\pi/2$

Answer: B

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15. Distance between the point (0, 1 , 7) and the plane $3x + 4y + 1 = 0$ is

A. 1 unit

B. 2 unit

C. 3 unit

D. 4 unit

Answer: A

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16. In a single throw of two dice, the chances of throwing a sum of 5 is :

A. 0

B. $\frac{1}{36}$

C. $\frac{1}{9}$

D. $\frac{5}{36}$

Answer: C

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Section A Fill In The Blanks

1.

$0, \frac{\pi}{2}, \frac{x}{(1-x^2)^{\frac{3}{2}}}, R = \{(3,8),(6,6),(9,4),(12,2)\}, 2x - y + 1 = 0, \begin{vmatrix} \overrightarrow{b} & \end{vmatrix}$

Let the relation R be defined in N by aRb if $2a + 3b = 30$, Then R = ...

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2. If $|A| = 2$, where A is a 2×2 matrix, then $|adjA|$ is .....

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3. If $y = \sin^{-1} x$, then $\frac{d^2y}{dx^2} = \ldots\ldots$

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4. The equation of the tangent to the curve $y = x^4 - 6x^3 + 13x^2 - 10x + 5$ at the point $x = 1$ is $\ldots\ldots$

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5. $\int_0^{\infty} \frac{1}{1+x^2} dx$ is equal to :

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6. Degree of differential equation $x^2\left(\frac{dy}{dx}\right)^2 - y\frac{d^3y}{dx^3} = 2$ is $\ldots\ldots$

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7. The shortest distance between two parallel line $\vec{r}_2 = \vec{a}_1 + \lambda \vec{b}$, $\vec{r}_2 = \vec{a}_2 + \mu \vec{b}$ is given by ……..

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8. If $P(A) = \frac{2}{7}, P(B) = \frac{3}{7}$ and $P(A \cup B) = \frac{5}{7}$, then P (A/B) equals . ……

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Section A True Or False

1. $\tan 1 > \tan^{-1} 1$

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2. $(A + B)' = A' + B$

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3. Derivative of $\sin^{-1}(\sin x)$ w.r.t. x is 1

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4. If $f(a-x) = -f(x)$, then $\int_0^{2a} f(x)dx = 0$

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5. If $\vec{a} = \hat{i} + 4\hat{j} + 4\hat{k}$ and $\vec{b} = 4\hat{i} - \hat{j} + 3\hat{k}$, then $\vec{a} \cdot \vec{b}$ is equal to 12

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6. If a line makes angles α, β, γ respectively with positive directions of the coordinate axes, then the value of $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$.

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7. If A and B are independent events, then $P(A' \cup B) = 1 - P(A)P(B')$.

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8. Quadrant represented by the region $x \geq 0, y \leq 0$ is

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Section B

1. Find the value of (y-x) from the following equation :

$$2\begin{bmatrix} x & 5 \\ 7 & y-3 \end{bmatrix}, + \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$$

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2. If the matrix $A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$ and $A^2 = kA$, then write the value of k.

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3. Find the equation of the normal at the point (am^2, am^3) for the curve $ay^2 = x^3$

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4. Show that the function $f(x) = x^7 + 8x^5 + 1$ is increasing function for all values of x.

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5. Find $\int \sqrt{1 - \sin 2x} dx, \frac{\pi}{4} < x < \frac{\pi}{2}.$

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6. Find the area of the region bounded by $x^3 = y - 3, y = 4, y = 6$ and y-axis in the first quadrant.

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7. Write a vector of magnitude 9 units in the direction vector $-2\hat{i} + \hat{j} + 2\hat{k}$.

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8. If $\left(\vec{a} \times \vec{b}\right)^2 + \left(\vec{a} \cdot \vec{b}\right)^2 = 225$ and $\left|\vec{a}\right| = 5$, then write the value of $\left|\vec{b}\right|$.

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9. Find the values of a, b, c and d from the equation : $\begin{bmatrix} a-b & 2a+c \\ 2a-b & 3c+d \end{bmatrix} = \begin{bmatrix} -1 & 5 \\ 0 & 13 \end{bmatrix}$ and write correct answer from the following:

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10. If A is a square matrix such that $A^2 = I$, then find the simplified value of $(A-I)^3 + (A+I)^3 - 7A$.

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11. Show that the function f given by $f(x) = x^3 - 3x^2 + 4x, x \in R$ is strictly increasing on R.

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12. Maximum value of the function sin x + cos x is .

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13. Evaluate the following integrals : $\int\left(\frac{x+\cos 6x}{3x^2+\sin 6x}\right)dx$

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14. Find the area of the region bounded by $x^2=4y, y=2, y=4$ and the y-axis in the first quadrant.

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15. Show that the vectors $2\hat{i}-\hat{j}+\hat{k}$ and $\hat{i}-3\hat{j}-5\hat{k}$ are at right angles.

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16. Find λ if $\left(2\hat{i}+6\hat{j}+14\hat{k}\right)\times\left(\hat{i}-\lambda\hat{j}+7\hat{k}\right)=\vec{0}$.

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Section C

1. Prove that $\tan^{-1} x + \tan^{-1} \frac{2x}{1-x^2} = \tan^{-1}\left(\frac{3x - x^3}{1 - 3x^2}\right), |x| < \frac{1}{\sqrt{3}}$

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2. If $x = a \sin 2t(1 + \cos 2t)$ and $y = b \cos 2t(1 - \cos 2t)$. show that $\left(\frac{dy}{dx}\right)_{t=\frac{\pi}{4}} = \frac{b}{a}$ Also find $\frac{dy}{dx}$ at $t = \frac{\pi}{3}$

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3. If $y = e^{a \cos^{-1} 3x}$, prove that $\left(1 - 9x^2\right) \frac{d^2y}{dx^2} - 9x \frac{dy}{dx} - 9a^2 y = 0.$

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4. Evaluate $\int x \sin^{-1} x dx$

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5. Find : $\int \frac{dx}{x(x^3+8)}$.

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

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7. Solve the differential equation : $x \sec^2\left(\frac{y}{x}\right)dy = \left\{y \sec^2\left(\frac{y}{x}\right) + x\right\}dx$.

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8. Bag A contains 3 red and 2 black balls, while bag B contains 2 red and 3 black balls. A ball drawn at random from bag A is transferred to bag B and one ball is drawn at randon from bag B. If this ball was found to be red ball, find the probability that the ball drawn from bag A was red.

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9. Three cards are drawn successively with replacement from a well shuffled pack of 52 cards. Find the probability distribution of the number spades.

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10. Prove that $\cot^{-1}\left(\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}\right)=\frac{\pi}{4}+\frac{1}{2}\cos^{-1}x$

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11. Differentiate the following w.r.t. x:

$x^{\sin x} + (\sin x)^{\cos x}$

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12. If $x = a\cos\theta + b\sin\theta$ and $y = a\sin\theta - b\cos\theta$, then prove that $y^2\frac{d^2y}{dx^2} - \frac{dy}{dx} + y = 0$

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13. If [x] stands for integral part of x, then show that $\int_0^1 [5x]dx = 2.$

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14. Find : $\int \frac{x^3 dx}{x^4 + 3x^2 + 2} dx.$

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15. Find the particular solution of the following differential equation : $\frac{dy}{dx} = 1 + x^2 + y^2 + x^2y^2$, given that $y = 1$ when $x = 0$.

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16. Suppose a girl throws a die. If she gets a 5 or 6, she tosses a coin three times and notes the numbers of heads. If she gets 1,2,3, or 4, she tosses a coin once and notes whether a head or a tail is obtained. If she attained exactly one head what is the probability that she threw 1,2,3, or 4 with the die?

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17. 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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Section D

1. Using matrices, solve the following of linear equations :

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

$2x + 3y + 2z = 2$

$3x - 3y - 4z = 11$

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2. If $A = \begin{bmatrix} 1 & -2 & 1 \\ 0 & -1 & 1 \\ 2 & 0 & -3 \end{bmatrix}$, find A^{-1} and solve the system of equations

$x - 2y + z = 0, \ -y + z = -2, 2x - 3z = 10$

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3. Find the equation of the plane passing through the line of intersection of the planes $2x + y - z = 3$ and $5x - 3y + 4z + 9 = 0$ and parallel to the line $\frac{x-1}{2} = \frac{y-3}{4} = \frac{5-z}{-5}$

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4. Find the shortest distance (S.D.) between the lines :

$\vec{r} = 2\hat{i} + 3\hat{j} + \hat{k} + \lambda\left(2\hat{i} - \hat{j} + 3\hat{k}\right)$ and $\vec{r} = 7\hat{i} + 5\hat{j} + 6\hat{k} + \mu\left(\hat{i} + 3\hat{j}\right.$

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5. Solve the following linear programming problems graphically :

Minimise and Maximise $Z = 5x + 10y$

subject to constraints

$x + 2y \leq 120$

$x + y \geq 60$

$x - 2y \geq 0$

$x, y \geq 0$

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6. Solve the following linear programming problem graphically:

Maximise z = $7x + 10y$ subject to the constraints :

$2x + 3y \leq 120, 2x + y \leq 80, x \geq 10, x, y \geq 0$

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7. If $A = \begin{bmatrix} 1 & -2 & 1 \\ 0 & -1 & 1 \\ 2 & 0 & -3 \end{bmatrix}$, find A^{-1} and solve the system of equations

$x - 2y + z = 0, \ -y + z = \ -2, 2x - 3z = 10$

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8. Prove the following identities :

$$\begin{vmatrix} a & a^2 & a^3 \\ b & b^2 & b^3 \\ c & c^2 & c^3 \end{vmatrix} = abc(a-b)(b-c)(c-a).$$

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9. Find the direction ratios of the normal to the plane, which passes through the points (1, 0, 0) and (0, 1, 0) and makes angle $\frac{\pi}{4}$ with the plane $x + y = 3$. Also find the equation of the plane.

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10. Find the coordinates of the foot of perpendicular and the length of the perpendicular drawn from the point $P(5, 4, 2)$ to the line $\vec{R} = -\hat{i} + 3\hat{j} + \hat{k} + \lambda\left(2\hat{i} + 3\hat{j} - \hat{k}\right)$. Also find the image of P in this line.

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11. Solve the following linear programming problems graphically

Minimize $Z = 5x + 7y$ subject to the constraints

$2x + y \geq 8, x + 2y \geq 10, x, y \geq 0$

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12. Maximize $z = 9x + 3y$ subject to the constraints

$2x + 3y \leq 13$

$2x + y \leq 5$

$x, y \geq 0$

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Section A Choose The Correct Option In The Following Questions

1. Range of the function $f(x) = \frac{|x-2|}{x-2}$ is

A. $\{-1, 1\}$

B. $\{-1, 2\}$

C. $\{-2, 2\}$

D. None of these

Answer: A

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2. $\tan^{-1}(\sqrt{3}) - \cos^{-1}\left(\frac{1}{2}\right)$ is equal to :

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

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

C. 0

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

Answer: C

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3. If $AB = C$ where A is a matrix of order 2×2 and C is a matrix of order 2×5, then the order of B is :

A. 3×5

B. 2×5

C. 3×3

D. 5×5

Answer: B

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4. For what value of 'x', is the matrix:

$A = \begin{bmatrix} 0 & 1 & -2 \\ -1 & 0 & 3 \\ x & -3 & 0 \end{bmatrix}$ a skew-symmetric matrix.

A. -2

B. -3

C. -4

D. -5

Answer: A

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5. If area of triangle is 35 sq. units with vertices (2,-6), (5, 4) and (k,4) then k is :

A. 12

B. -2

C. $-12, \ -2$

D. $12, \ -2$

Answer: D

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6. If $f(x) = \begin{cases} \frac{x^2-25}{x-5} & , \quad x \neq 5 \\ k & , \quad x = 5 \end{cases}$ is continuous at x=5, then k is equal to:

A. 10

B. 5

C. 0

D. 4

Answer: A

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7. Derivative of $\left(\sin^{-1} x + \cos^{-1} x\right)$ w.r.t 'x' is equal to :

A. -1

B. 0

C. 1

D. 2

Answer: B

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8. If $y = \left(3x^2 + 2\right)^2$, then $\frac{dy}{dx}$ is

A. $3x^2 + 2$

B. $x\left(3x^2 + 2\right)$

C. $10x\left(3x^2 + 2\right)$

D. $12x\left(3x^2 + 2\right)$

Answer: D

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9. $\int \frac{10x^9 + 10^x \log_e 10}{x^{10} + 10^x}$ dx is equal to :

A. $\log\left|x^{10} + 10^x\right| + c$

B. $10^x + 10^{10} + c$

C. $10^x - x^{10} + x$

D. $\left(10^x - x^{10}\right)^{-1} + c$

Answer: A

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10. Choose the correct answer: $\int e^x \sec x(1+\tan x)dx$ equals :

A. $e^x \cos x + C$

B. $e^x \sec x + C$

C. $e^x \sin x + C$

D. $e^x \tan x + C$

Answer: B

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11. The number of arbitrary constants in the particular solution of a differential equation of Third order is :

A. 0

B. 2

C. 3

D. 5

Answer: A

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12. Solve the following differential equations

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

A. x

B. x^2

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

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

Answer: C

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13. The projection of $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ on $\vec{b} = \hat{i} - 2\hat{j} + \hat{k}$ is equal to :

A. $\frac{5\sqrt{6}}{3}$

B. $\frac{5}{\sqrt{6}}$

C. $\frac{6}{\sqrt{14}}$

D. $\frac{\sqrt{6}}{5}$

Answer: B

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14. If $\left|\vec{a}\right| = 5, \left|\vec{b}\right| = 4$ and $\vec{a}.\vec{b} = 16$, then $\left|\vec{a} \times \vec{b}\right|$ is

A. 10

B. 12

C. 14

D. 16

Answer: B

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15. The distance between the planes, $3x+2y-6z-14=0$ and $3x+2y-6z+21=0$ is,

A. 35

B. 7

C. 1

D. 5

Answer: D

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16. In a single throw of two dice, the probability of getting total of 7 or 9 is :

A. 0

B. $\frac{1}{36}$

C. $\frac{1}{9}$

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

Answer: D

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Section A Fill In The Blanks From The Given Options

1. Consider the set A = {1, 2, 3} and R be the smallest equivalence relation on A, then R = ...

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2.

$\frac{1}{5}, R = \{(1,1),(2,2),(3,3)\}, 0, \frac{2\tan^{-1}x}{1+x^2}$, Parallel , $\left(\vec{b}_1 \times \vec{b}_2\right).\left(\vec{a}\right.$

The value of the det. $\begin{vmatrix} x+y & y+z & z+x \\ z & x & y \\ 1 & 1 & 1 \end{vmatrix}$ is .....

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3.

$0, \frac{\pi}{2}, \frac{x}{(1-x^2)^{\frac{3}{2}}}, R = \{(3,8),(6,6),(9,4),(12,2)\}, 2x - y + 1 = 0, \left|\frac{\vec{b}}{}\right.$

Let the relation R be defined in N by aRb if $2a + 3b = 30$, Then R = ...

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4. Show that the tangents to the curve y= $7x^3 + 11$ at the points x = 2 and x =-2 are parallel.

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5. $\int_0^{\pi/2}\left(\frac{\sqrt{\cos x}}{\sqrt{\sin x}+\sqrt{\cos x}}\right)dx$ is equal to

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6. The number of arbitrary constants in the general solution of a differential equation of fourth order are:

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7. The two lines $\vec{r}_2 = \vec{a}_1 + \lambda\vec{b}$, $\vec{r}_2 = \vec{a}_2 + \mu\vec{b}$ will intersect if d = ...

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8. If A and B are independent events and if $P(A)=\frac{1}{2}, P(B)=\frac{2}{5}, then$ P(A cap B)` is equal to :

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Section A State True Or False For The Following Statements

1. The value of `sin^-1 (sin (2π/3)) is :

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2. Value of $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix}$ is zero, where ω, ω^2 are imaginary cube roots of unity.

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3. Derivative of $\sin^{-1}(\sin 2x)$ w.r.t x is 2

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4. Solve $\int \frac{2x}{1+x^2}\,dx$

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5. If $\vec{a} = \hat{i} + 5\hat{j} + 4\hat{k}$ and $\vec{b} = 5\hat{i} - \hat{j} + 2\hat{k}$, then $\vec{a} \cdot \vec{b}$ is equal to 8

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6. If a line makes angles α, β, γ respectively with positive directions of the coordinate axes, then the value of $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$.

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7. Let P (A) > 0 and P $(B) > 0$. Then A and B can be both mutually exclusive and independent."

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8. Quadrant represented by the region $x \geq 0, y \leq 0$ is

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