

MATRIX

1. If A is a square matrix of order 2 and $|A| = -2$, then value of $|5A'|$ is:
(A) -50
(B) -10
(C) 10
(D) 50
2. The product of matrix P and Q is equal to a diagonal matrix. If the order of matrix Q is 3×2 , then the order of matrix P is:
(A) 2×2
(B) 3×3
(C) 2×3
(D) 3×2
3. If the inverse of matrix $\begin{bmatrix} 7 & -3 & -3 \\ -1 & 1 & 0 \\ -1 & 0 & 1 \end{bmatrix}$ is the matrix $\begin{bmatrix} 1 & 3 & 3 \\ 1 & \lambda & 3 \\ 1 & 3 & 4 \end{bmatrix}$, then value of λ is:
(A) -4
(B) 1
(C) 3
(D) 4
4. Find the matrix A^2 , where $A = [a_{ij}]$ is a 2×2 matrix whose elements are given by $a_{ij} = \text{maximum}(i, j) - \text{minimum}(i, j)$:
(A) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$
(B) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$
(C) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

(D) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$

5. If A is a square matrix of order 3 such that the value of $|\text{adj}.A| = 8$, then the value of $|A^T|$ is:

- (A) $\sqrt{2}$
 (B) $-\sqrt{2}$
 (C) 8
 (D) $2\sqrt{2}$

6. If A and B are events such that $P(A/B) = P(B/A) \neq 0$, then:

- (A) $A \subset B$, but $A \neq B$
 (B) $A = B$
 (C) $A \cap B = \phi$
 (D) $P(A) = P(B)$

DERIVATIONS

1. Derivative of $e^{\sin^2 x}$ with respect to $\cos x$ is:

- (A) $\sin x e^{\sin^2 x}$
 (B) $\cos x e^{\sin^2 x}$
 (C) $-2\cos x e^{\sin^2 x}$
 (D) $-2\sin^2 x \cos x e^{\sin^2 x}$

2. If $\sin(xy) = 1$, then $\frac{dy}{dx}$ is equal to:

- (A) $\frac{x}{y}$
 (B) $-\frac{x}{y}$
 (C) $\frac{y}{x}$
 (D) $-\frac{y}{x}$

3. The general solution of the differential equation

$\frac{dy}{dx} = e^{x+y}$ is:

- (A) $e^x + e^{-y} = c$
- (B) $e^{-x} + e^{-y} = c$
- (C) $e^{x+y} = c$
- (D) $2e^{x+y} = c$

EQUATIONS

1. Given a curve $y = 7x - x^3$ and x increases at the rate of 2 units per second. The rate at which the slope of the curve is changing, when $x = 5$ is:
 - (A) -60 units/sec
 - (B) 60 units/sec
 - (C) -70 units/sec
 - (D) -140 units/sec
2. The area of the region bounded by the curve $y^2 = 4x$ and $x = 1$ is:
 - (A) $\frac{4}{3}$
 - (B) $\frac{8}{3}$
 - (C) $\frac{64}{3}$
 - (D) $\frac{32}{3}$
3. The angle which the line $\frac{x}{1} = \frac{y}{-1} = \frac{z}{0}$ makes with the positive direction of Y-axis is:
 - (A) $\frac{5\pi}{6}$
 - (B) $\frac{3\pi}{4}$
 - (C) $\frac{5\pi}{4}$
 - (D) $\frac{7\pi}{4}$

FUNCTIONS

1. The function $f(x) = \frac{x}{2} + \frac{2}{x}$ has a local minima at x is equal to:
 - (A) 2
 - (B) 1

- (C) 0
(D) -2

2. A function $f : \mathbb{R} \rightarrow \mathbb{R}$ defined as $f(x) = x^2 - 4x + 5$ is:

- (A) injective but not surjective.
(B) surjective but not injective.
(C) both injective and surjective.
(D) neither injective nor surjective.

INTEGRATIONS

1. The value of $\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \cot \theta \operatorname{cosec}^2 \theta d\theta$ is:

- (A) $\frac{1}{2}$
(B) $-\frac{1}{2}$
(C) 0
(D) $-\frac{\pi}{8}$

2. The integral $\int \frac{dx}{\sqrt{9-4x^2}}$ is equal to:

- (A) $\frac{1}{6} \sin^{-1}\left(\frac{2x}{3}\right) + c$
(B) $\frac{1}{2} \sin^{-1}\left(\frac{2x}{3}\right) + c$
(C) $\sin^{-1}\left(\frac{2x}{3}\right) + c$
(D) $\frac{3}{2} \sin^{-1}\left(\frac{2x}{3}\right) + c$

VECTORS

1. The Cartesian equation of the line passing through the point $(1, -3, 2)$ and parallel to the line:

$$\vec{r} = (2 + \lambda)\hat{i} + \lambda\hat{j} + (2\lambda - 1)\hat{k} \text{ is}$$

- (A) $\frac{x-1}{2} = \frac{y+3}{0} = \frac{z-2}{-1}$
(B) $\frac{x+1}{1} = \frac{y-3}{1} = \frac{z+2}{2}$

$$(C) \frac{x+1}{2} = \frac{y-3}{0} = \frac{z+2}{-1}$$

$$(D) \frac{x-1}{1} = \frac{y+3}{1} = \frac{z-2}{2}$$

2. The position vectors of points P and Q are \vec{p} and \vec{q} respectively. The point R divides the line segment PQ in the ratio $3 : 1$ and S is the mid-point of line segment PR . The position vector of S is:

$$(A) \frac{\vec{p}+3\vec{q}}{4}$$

$$(B) \frac{\vec{p}+3\vec{q}}{8}$$

$$(C) \frac{5\vec{p}+3\vec{q}}{4}$$

$$(D) \frac{5\vec{p}+3\vec{q}}{8}$$

3. **Assertion (A) :** The vectors

$$\vec{a} = 6\hat{i} + 2\hat{j} - 8\hat{k}$$

$$\vec{b} = 10\hat{i} - 2\hat{j} - 6\hat{k}$$

$$\vec{c} = 4\hat{i} - 4\hat{j} + 2\hat{k}$$

represent the sides of a right angled triangle.

Reason (R) : Three non-zero vectors of which none of two are collinear forms a triangle if their resultant is zero vector or sum of any two vectors is equal to the third.