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 $A = \left[a_{ij}\right]$ is a 2×2 matrix whose elements are given by a_{ij} = maximum(i, j) - 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 $|A^{\top}|$ 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 $f : |R- > |R$ 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 $\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \cot\theta \ \mathrm{cosec}^2\theta \, d\theta$ 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:

   $\overrightarrow{r} = (2+\lambda)\hat{i} + \lambda\hat{j} + (2\lambda-1)\hat{k}$ 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.