

ASSIGNMENT-1

August 30, 2024

Questions

1 VECTOR GRAPHS

1. The position vectors of points P and Q are \vec{p} and \vec{q} respectively. The point R divides 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) $\frac{5\vec{p}+3\vec{q}}{8}$

2. 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) $\frac{7\pi}{4}$

3. The Cartesian equation of the line passing through the point $(1, -3, 2)$ and parallel to the line $\vec{r} = (2 + \lambda)\hat{i} + \lambda\hat{j} + (2\lambda - 1)\hat{k}$ is

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

1. $\int \frac{1}{x(\log x)^2} dx$ is equal to :
(A) $2\log(\log x) + c$
(B) $-\frac{1}{\log x} + c$
(C) $\frac{(\log x)^3}{3} + c$
(D) $\frac{3}{(\log x)^3} + c$
2. The value of $\int_{-1}^1 x|x|dx$ is :
(A) $\frac{1}{6}$
(B) $\frac{1}{3}$
(C) $\frac{1}{6}$
(D) 0

3 AREA AND CURVES

1. Area of the region bounded by curve $y^2 = 4x$ and the X - axis between $x = 0$ and $x = 1$ is :
(A) $\frac{2}{3}$
(B) $\frac{8}{3}$
(C) 3
(D) $\frac{4}{3}$
2. Given a curve $y = 7x - x^3$ and x increases at the rate of 2unitspersecond . The rate at which the slope of the curve is changing, when $x = 5$ is :
(A) -60units/sec
(B) 60units/sec
(C) -70units/sec
(D) -140units/sec

4 MATRIX

1. If $A = \begin{bmatrix} a & c & -1 \\ b & 0 & 5 \\ 1 & -5 & 0 \end{bmatrix}$ is a skew symmetric matrix, then the value of $2a - (b + c)$ is :
(A) 0

- (B) 1
(C) -10
(D) 10
2. If A is a square matrix of order 3 such that the value of $|adj.A| = 8$, then the value of $|A^T|$ is :
- (A) $\sqrt{2}$
(B) $-\sqrt{2}$
(C) 8
(D) $2\sqrt{2}$
3. If 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. If $\begin{bmatrix} x & 2 & 0 \end{bmatrix} \begin{bmatrix} 5 \\ -1 \\ x \end{bmatrix} = \begin{bmatrix} 3 & 1 \end{bmatrix} \begin{bmatrix} -2 \\ x \end{bmatrix}$, then value of x is :
- (A) -1
(B) 0
(C) 1
(D) 2
5. 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) $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$

5 PROBABILITY

1. 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) $P(A) = P(B)$

6 FUNCTIONS

1. 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
2. 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

7 DIFFERENTIAL EQUATIONS

1. If $xe^y = 1$, then the value of $\frac{dy}{dx}$ at $x = 1$ is :
 - (A) -1
 - (B) 1
 - (C) $-e$
 - (D) $-\frac{1}{e}$
2. 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) $-2 \sin^2 x \cos x e^{\sin^2 x}$

3. The order of the differential equation $\frac{d^4 y}{dx^4} - \sin\left[\frac{d^2 y}{dx^2}\right] = 5$ is
- (A) 4
 - (B) 3
 - (C) 2
 - (D) notdefined

8 ASSERTION

1. Assertion-Reason Based Questions

Direction: In questions numbers 19 and 20, two statements are given one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer from the following options:

- (a) Both Assertion (A) and Reason (R) are true and the Reason (R) is the correct explanation of the Assertion (A).
- (b) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of the Assertion (A).
- (c) Assertion (A) is true, but Reason (R) is false.
- (d) Assertion (A) is false, but Reason (R) is true.

Assertion (A): Domain of $y = \cos^{-1} x$ is $[-1, 1]$.

Reason (R) : The range of the principal value branch of $y = \cos^{-1} x$ is $[0, \pi] - \frac{\pi}{2}$.