SAMPLE QUESTIONS

MATHEMATICS

1. Let ω be the cube root of unity, then $\begin{vmatrix} 1+\omega & \omega & \omega^2 \\ 2\omega^2 & 1+\omega^2 & 1+2\omega \\ -\omega^2 & 2\omega & 1+\omega^2 \end{vmatrix} =$

   A) -2 B) 1 C) $-6-8\omega$ D) $-6+8\omega$

2. The length of latus rectum of parabola $13(x-2)^2 + 13(y-3)^2 = 2x - 3y + 18$ is

   A) $\sqrt{13}$ B) $2\sqrt{13}$ C) $31/\sqrt{13}$ D) $62/\sqrt{13}$

3. If $2x + \alpha y + 4 = 0$ is a tangent to parabola $x^2 = y$, then α =

   A) 1/4 B) 1 C) 4 D) 1/2

4. The position vectors of four points P, Q, R and S are $(2\hat{\imath} + \hat{\jmath} - k), (\hat{\jmath} - 2\hat{k}), (3\hat{\imath} - \hat{\jmath} + 2\hat{k})$ and $(\hat{\imath} - \hat{\jmath} - \hat{k})$, respectively. The angle between $\overrightarrow{PQ}$ and $\overrightarrow{RS}$ is

   A) $cos^{-1}\left(\frac{7}{\sqrt{65}}\right)$ B) $cos^{-1}\left(-\frac{7}{\sqrt{65}}\right)$ C) $cos^{-1}\left(\frac{1}{\sqrt{65}}\right)$ D) $cos^{-1}\left(-\frac{1}{\sqrt{65}}\right)$

5. The value of λ for which the position vectors $(\hat{\imath} + \hat{\jmath} + \hat{k}), (2\hat{\imath} + \lambda\hat{\jmath} + 2\hat{k}), (\hat{\imath} - \hat{\jmath} - \hat{k})$ and $(2\hat{\imath} + \hat{\jmath} - \lambda\hat{k})$ are coplaner is

   A) 3/2 B) 1/2 C) 3 D) 1

6. The water is leaking from a spherical balloon of 5 meter radius and the radius decreases at the rate of 10 cm/s. The rate of change in the volume of balloon is

   A) $1000\,\pi\ m^2/s$ B) $100\,\pi\ m^2/s$ C) $10\,\pi\ m^2/s$ D) $\frac{10\pi}{3} m^2/s$

7. The value of $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} [\exp(|x|) - |\sin x|]dx$ is

   A) $\exp(\pi)$ B) $\exp(\pi) + 2$ C) $2\exp\left(\frac{\pi}{2}\right) - 4$ D) $2\exp\left(\frac{\pi}{2}\right)$

8. The solution of differential equation $(x^4 + y^4)dy - yx^3dx = 0$ is

   A) $4\log\left|\frac{y}{x}\right| - y = constant$

   B) $4\log\left|\frac{y}{x}\right| + y = constant$

   C) $\log|y| + \frac{y^4}{4x^4} = constant$

   D) $\log|y| - \frac{y^4}{4x^4} = constant$

9. A train has n stoppages at various stations and suppose m passengers $(n \geq m)$ are travelling in the train. The probability that no two passengers get down at the same station is

   A) $\frac{{}^{n}C_m}{n^m}$ B) $\frac{{}^{n}C_m}{m^n}$ C) $\frac{{}^{n}P_m}{m^n}$ D) $\frac{{}^{n}P_m}{n^m}$

10. Suppose that a random variable X has a Poisson distribution with mean 5. The value of probability that $X > 1$ is

    A) e^{-5} B) $1 - 2e^{-5}$ C) $6e^{-5}$ D) $1 - 6e^{-5}$

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