

JEE-MAINS-2020-09/01/2020-shift-1

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- 1) If C be the centroid of the triangle having vertices $(3, -1), (1, 3)$ and $(2, 4)$. Let P be the point of intersection of the lines $x + 3y - 1 = 0$ and $3x - y + 1 = 0$, then the line passing through the point:
 - a) $(-9, -7)$
 - b) $(-9, -6)$
 - c) $(7, 6)$
 - d) $(9, 7)$
- 2) The product $2^{\frac{1}{4}} \times 4^{\frac{1}{16}} \times 8^{\frac{1}{48}} \times 16^{\frac{1}{128}} \dots \infty$ is equal to
 - a) $2^{\frac{1}{4}}$
 - b) 2
 - c) $2^{\frac{1}{2}}$
 - d) 1
- 3) A spherical iron ball of 10 cm radius is coated with a layer of ice of uniform thickness that melts at the rate of $50 \text{ cm}^3/\text{min}$. When the thickness of ice is 5 cm, then the rate (cm/min.) at which the thickness of ice decreases, is:
 - a) $\frac{5}{6\pi}$
 - b) $\frac{1}{54\pi}$
 - c) $\frac{1}{36\pi}$
 - d) $\frac{1}{18\pi}$
- 4) Let f be a function continuous on $[a, b]$ and twice differentiable on (a, b) . If for all $x \in (a, b)$, $f' > 0$ and $f'' < 0$, then for any $c \in (a, b)$, $(f(c) - f(a)) - (f(b) - f(c))$ is greater than:
 - a) $(b - c) / (c - a)$
 - b) 1
 - c) $(c - a) / (b - c)$
 - d) $(b + a) / (b - a)$
- 5) The value of $\cos^3\left(\frac{\pi}{8}\right)\cos\left(\frac{3\pi}{8}\right) + \sin^3\left(\frac{\pi}{8}\right)\sin\left(\frac{3\pi}{8}\right)$ is:
 - a) $\frac{1}{4}$
 - b) $\frac{1}{2\sqrt{2}}$
 - c) $\frac{1}{2}$
 - d) $\frac{1}{\sqrt{2}}$
- 6) The number of real roots of the equation, $e^{4x} + e^{3x} - 4e^{2x} + e^x + 1 = 0$ is
 - a) 3
 - b) 4
 - c) 1
 - d) 2
- 7) The value of $\int_0^{2\pi} \frac{x \sin^8 x}{\sin^8 x + \cos^8 x} dx$ is equal to
 - a) 2
 - b) 4
 - c) 2^2
 - d) π^2
- 8) If for some α and β in R , the intersection of the following three planes

$$\begin{aligned} x + 4y - 2z &= 1 \\ x + 7y - 5z &= \beta \\ x + 5y + \alpha z &= 5 \end{aligned}$$
 is a line in R^3 , then $\alpha + \beta$ is equal to:
 - a) 0
 - b) 10
 - c) -10
 - d) 2
- 9) If e_1 and e_2 are the eccentricities of the ellipse, $\left(\frac{x^2}{18}\right) + \left(\frac{y^2}{4}\right) = 1$ and the hyperbola, $\left(\frac{x^2}{9}\right) - \left(\frac{y^2}{4}\right) = 1$ respectively and (e_1, e_2) is a point on the ellipse, $15x^2 + 3y^2 = k$. Then k is equal to:
 - a) 14
 - b) 15
 - c) 17
 - d) 18
- 10) If $f(x) = \begin{cases} \frac{\sin(a+2)x + \sin x}{x}, & x < 0 \\ b, & x = 0 \\ \frac{(x+3x^{\frac{2}{3}} - x^{\frac{1}{3}})}{x^{\frac{4}{3}}}, & x > 0 \end{cases}$ is continuous at $x = 0$ then $a + 2b$ is equal to:
 - a) -2
 - b) 1
 - c) 0
 - d) 1
- 11) If the matrices

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 3 & 4 \\ 1 & -1 & 3 \end{bmatrix},$$
 then $B = \text{adj } A$ and $C = 3A$,

$\frac{|adj B|}{|C|}$ is equal to

- a) 16
- b) 2
- c) 8
- d) 72

12) A circle touches the y-axis at the point (0, 4) and passes through the point (2, 0). Which of the following lines is not a tangent to the circle?

- a) $4x - 3y + 17 = 0$
- b) $3x + 4y - 6 = 0$
- c) $4x + 3y - 8 = 0$
- d) $3x - 4y - 24 = 0$

13) Let Z be a complex number such that $\left| \frac{z-i}{z+2i} \right| = 1$ and $|z| = \frac{5}{2}$. Then the value of $|z + 3i|$ is:

- a) $\sqrt{10}$
- b) $\frac{7}{2}$
- c) $\frac{15}{4}$
- d) $2\sqrt{3}$

14) If $f'(x) = \tan^{-1}(\sec x + \tan x)$, $\left(\frac{-\pi}{2}\right) < x < \left(\frac{\pi}{2}\right)$, and $f(0) = 0$, then $f(1)$ is equal to:

- a) $\frac{(\pi+1)}{4}$
- b) $\frac{(\pi+2)}{4}$
- c) $\frac{1}{4}$
- d) $\frac{(\pi-1)}{4}$

15) Negation of the statement: ' $\sqrt{5}$ is an integer or 5 is irrational' is:

- a) $\sqrt{5}$ is irrational or 5 is an integer.
- b) $\sqrt{5}$ is not an integer or 5 is not irrational
- c) $\sqrt{5}$ is an integer and 5 is irrational
- d) $\sqrt{5}$ is not an integer and 5 is not irrational