

JEE-MAINS-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:
- $(-9, -7)$
 - $(-9, -6)$
 - $(7, 6)$
 - $(9, 7)$
- 2) The product $2^{\frac{1}{4}} \times 4^{\frac{1}{16}} \times 8^{\frac{1}{48}} \times 16^{\frac{1}{128}} \cdots \infty$ is equal to
- $2^{\frac{1}{4}}$
 - 2
 - $2^{\frac{1}{2}}$
 - 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:
- $\frac{5}{6\pi}$
 - $\frac{54\pi}{1}$
 - $\frac{36\pi}{1}$
 - $\frac{1}{18\pi}$
- 4) Let f be any 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:
- $(b - c) / (c - a)$
 - 1
 - $(c - a) / (b - c)$
 - $(b + a) / (b - a)$
- 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:
- $\frac{1}{4}$
 - $\frac{1}{2\sqrt{2}}$
 - $\frac{1}{2}$
 - $\frac{1}{\sqrt{2}}$
- 6) The number of real roots of the equation, $e^{4x} + e^{3x} - 4e^{2x} + e^x + 1 = 0$ is
- 3
 - 4
 - 1
 - 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

$$x + 4y - 2z = 1$$

$$x + 7y - 5z = \beta$$

$$x + 5y + \alpha z = 5$$

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

$$10) \text{ If } f(x) = \begin{cases} \frac{\sin(a+2)x + \sin x}{x} & , x < 0 \\ b & , x = 0 \\ \frac{(x+3x^{\frac{2}{3}} - x^{\frac{1}{3}})}{\frac{4}{x^3}} & , x > 0 \end{cases}$$

is continuous at $x = 0$ then $a + 2b$ is equal to:

- a) -2
- b) 1
- c) 0
- d) 1

11) If the matrices

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

$\frac{|\text{adj } B|}{|C|}$ 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 $f'(x) = \tan^{-1}(\sec x + \tan x)$, $-\frac{\pi}{2} < x < \frac{\pi}{2}$, 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