

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

ai24btech11024 PRAHLADHA

- 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 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:
  - 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)  $\pi^2$
- 8) If for some  $\alpha$  and  $\beta$  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) 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
 
$$A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 3 & 4 \\ 1 & -1 & 3 \end{bmatrix},$$
 then  $B = \text{adj } A$  and  $C = 3A$ , then

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