

# MAINS

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16) If  $\frac{dy}{dx} = \frac{xy}{x^2+y^2}$  and  $y(1) = 1$ , then a value of  $x$  satisfying  $y(x) = e$  is:

- a)  $\sqrt{3}e$  c)  $\sqrt{2}e$   
b)  $\frac{1}{2}\sqrt{3}e$  d)  $\frac{e}{\sqrt{2}}$

17) If one end of focal chord  $AB$  of the parabola  $y^2 = 8x$  is at  $A\left(\frac{1}{2}, -2\right)$ , then the equation of the tangent at  $B$  is:

- a)  $x + 2y + 8 = 0$                       c)  $x - 2y + 8 = 0$   
b)  $2x - y - 24 = 0$                       d)  $2x + y - 24 = 0$

18) Let  $a_n$  be the  $n^{\text{th}}$  term of a G.P. of positive terms. If  $\sum_{n=1}^{100} a_{2n+1} = 200$  and  $\sum_{n=1}^{100} a_{2n} = 100$ , then  $\sum_{n=1}^{200} a_n$  is equal to:

- a) 300                      c) 225
- b) 175                      d) 150

19) A random variable  $X$  has the following probability distribution. Then  $P(X > 2)$  is:

$X$	1	2	3	4	5
$P(X)$	$K^2$	$2K$	$K$	$2K$	$5K^2$

- a)  $\frac{7}{12}$
- b)  $\frac{23}{26}$
- c)  $\frac{1}{36}$
- d)  $\frac{1}{6}$

20) If  $\int \frac{d\theta}{\cos^2 \theta (\tan 2\theta + \sec 2\theta)} = \lambda \tan \theta + 2 \log_e |f(\theta)| + C$ , where  $C$  is the constant of integration, then the ordered point  $(\lambda, f(\theta))$  is:

- a)  $(-1, 1 - \tan \theta)$
- b)  $(-1, 1 + \tan \theta)$
- c)  $(1, 1 + \tan \theta)$
- d)  $(1, 1 - \tan \theta)$

- 21) Let  $\mathbf{a}$ ,  $\mathbf{b}$ , and  $\mathbf{c}$  be three vectors such that  $|\mathbf{a}| = 3$ ,  $|\mathbf{b}| = 5$ ,  $\mathbf{a} \cdot \mathbf{b} = 10$  and the angle between  $\mathbf{b}$  and  $\mathbf{c}$  is  $\frac{\pi}{3}$ . If  $\mathbf{a}$  is perpendicular to vector  $\mathbf{b} \times \mathbf{c}$ , then  $|\mathbf{a} \times (\mathbf{b} \times \mathbf{c})|$  is equal to \_\_\_\_\_
- 22) If  $C_r = {}^{25}C_r$  and  $C_0 + 5 \cdot C_1 + 9 \cdot C_2 + \cdots + 101 \cdot C_{25} = 2^{25} \cdot k$  then  $k$  is equal to \_\_\_\_\_
- 23) If the curves  $x^2 - 6x + y^2 + 8 = 0$  and  $x^2 - 8y + y^2 + 16 - k = 0$ , ( $k > 0$ ) touch each other at a point, then the largest value of  $k$  is \_\_\_\_\_
- 24) The number of terms common to the A.P.'s  $3, 7, 11, \dots, 407$  and  $2, 9, 16, \dots, 709$  is \_\_\_\_\_
- 25) If the distance between the plane,  $23x - 10y - 2z + 48 = 0$  and the plane containing the lines  $\frac{x+1}{2} = \frac{y-3}{4} = \frac{z+1}{3}$  and  $\frac{x+3}{2} = \frac{y+2}{6} = \frac{z-1}{\lambda}$ , ( $\lambda \in R$ ) is equal to  $\frac{k}{\sqrt{633}}$  the  $k$  is equal to \_\_\_\_\_