

TANGENT & NORMAL

SOLUTION**1. NTA Ans. (2)**

Sol. $x^2 + 2xy - 3y^2 = 0$

m_N = slope of normal drawn to curve at (2,2) is -1

$$L : x + y = 4.$$

perpendicular distance of L from (0,0)

$$= \frac{|0+0-4|}{\sqrt{2}} = 2\sqrt{2}$$

(2) Option

2. NTA Ans. (4.00)

Sol. Let $P(\alpha, \beta)$

$$\text{so, } \beta^2 - 3\alpha^2 + \beta + 10 = 0 \quad \dots(i)$$

$$\text{Now, } 2yy' - 6x + y' = 0$$

$$\Rightarrow m = \frac{6\alpha}{2\beta + 1} \quad \dots(ii)$$

$$\text{Also, } \frac{\beta - 2}{\alpha} = -\frac{1}{m}$$

$$\Rightarrow \frac{2\beta - 3}{2\alpha} = -\frac{(2\beta + 1)}{6\alpha} \quad (\text{from (ii)})$$

$$\Rightarrow \beta = 1 \Rightarrow \alpha^2 = 4 \quad (\text{from (1)})$$

$$\text{Hence, } |m| = \frac{12}{3} = 4.00$$

3. Official Ans. by NTA (3)

Sol. Slope of tangent to the curve $y = x + \sin y$

$$\text{at } (a, b) \text{ is } \frac{2 - \frac{3}{2}}{\frac{1}{2} - 0} = 1$$

$$\Rightarrow \left. \frac{dy}{dx} \right|_{x=a} = 1$$

$$\frac{dy}{dx} = 1 + \cos y \cdot \frac{dy}{dx} \quad (\text{from equation of curve})$$

$$\left. \frac{dy}{dx} \right|_{x=a} = 1 + \cos b \cdot \left. \frac{dy}{dx} \right|_{x=a}$$

$$\Rightarrow \cos b = 0$$

$$\Rightarrow \sin b = \pm 1$$

Now, from curve $y = x + \sin y$

$$b = a + \sin b$$

$$\Rightarrow |b - a| = |\sin b| = 1$$

4. Official Ans. by NTA (2)

Sol. Given equation of curve

$$y = (1+x)^{2y} + \cos^2(\sin^{-1}x)$$

$$\text{at } \boxed{x=0}$$

$$y = (1+0)^{2y} + \cos^2(\sin^{-1}0)$$

$$y = 1 + 1$$

$$\boxed{y=2}$$

So we have to find the normal at (0, 2)

$$\text{Now } y = e^{2y \ln(1+x)} + \cos^2 \left(\cos^{-1} \sqrt{1-x^2} \right)$$

$$y = e^{2y \ln(1+x)} + \left(\sqrt{1-x^2} \right)^2$$

