



Tangents and Normals Ex 16.1 Q1(ix)

We know that the slope of the tangent to the curve $y = f(x)$ is

$$\frac{dy}{dx} = f'(x) \quad \text{---(A)}$$

And the slope of the normal is

$$\frac{-1}{\frac{dy}{dx}} = \frac{-1}{f'(x)} \quad \text{---(B)}$$

$$x^2 + 3y + y^2 = 5$$

Differentiating with respect to x , we get

$$2x + 3\frac{dy}{dx} + 2y\frac{dy}{dx} = 0$$

$$\Rightarrow \frac{dy}{dx}(3 + 2y) = -2x$$

$$\Rightarrow \frac{dy}{dx} = \frac{-2x}{3 + 2y}$$

So, the slope of tangent at $(1,1)$ is

$$\frac{dy}{dx} = \frac{-2 \cdot 1}{3 + 2 \cdot 1} = \frac{-2}{5}$$

The slope of normal is

$$\frac{-1}{\frac{dy}{dx}} = \frac{5}{2}$$

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$$xy = 6$$

Differentiating with respect to x , we get

$$y + x \frac{dy}{dx} = 0$$

$$\Rightarrow \frac{dy}{dx} = \frac{-y}{x}$$

\therefore Slope of tangent at $(1, 6)$ is

$$\frac{dy}{dx} = -6 \text{ and}$$

Slope of normal is

$$\frac{-1}{\frac{dy}{dx}} = \frac{1}{6}$$

Tangents and Normals Ex 16.1 Q2

Differentiating with respect to x , we get

$$y + x \frac{dy}{dx} + a + b \frac{dy}{dx} = 0$$

$$\Rightarrow \frac{dy}{dx}(x+b) = -(a+y)$$

$$\Rightarrow \frac{dy}{dx} = \frac{-(a+y)}{x+b}$$

$$\therefore \text{Slope of tangent} = \left(\frac{dy}{dx} \right)_{x=1, y=1} = \frac{-(a+1)}{b+1} = 2 \quad \text{[given]}$$

$$\Rightarrow -(a+1) = 2b+2$$

$$\Rightarrow 2b+a = -3 \quad \text{---(i)}$$

Also, $(1, 1)$ lies on the curve, so $x = 1, y = 1$ satisfies the equation

$$xy + ax + by = 2$$

$$\Rightarrow 1+a+b = 2$$

$$\Rightarrow a+b = 1 \quad \text{---(ii)}$$

Solving (i) and (ii), we get

$$a = 5, b = -4$$

Tangents and Normals Ex 16.1 Q3

We have,

$$y = x^3 + ax + b \quad \text{---(i)}$$

$$x - y + 5 = 0 \quad \text{---(ii)}$$

Now,

Point $(1, -6)$ lies on (i), so,

$$-6 = 1 + a + b$$

$$\Rightarrow a + b = -7 \quad \text{---(iii)}$$

Also,

Slope of tangent to (i) is

$$\frac{dy}{dx} = 3x^2 + a$$

$$\Rightarrow \left(\frac{dy}{dx} \right)_{(1, -6)} = 3 + a$$

And slope of tangent to (ii) is

$$\frac{dy}{dx} = 1$$

According to the question slope of (i) and (ii) are parallel

$$\therefore 3 + a = 1$$

$$\Rightarrow a = -2$$

From (iii)

$$b = -5$$

***** END *****