

$$3) x^2 + y^2 + 3xy = 11 \text{ at point } (1, 2)$$

$$\frac{dy}{dx} = 2x + 2y \frac{dy}{dx} + 3 \left(x \frac{dy}{dx} + y \right) = 0$$

$$2x + 2y \frac{dy}{dx} + 3 \left(x \frac{dy}{dx} + y \right) = 0$$

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

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

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

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

$$\frac{dy}{dx} \Big|_{x=1, y=2} = \frac{-2(1) - 3(2)}{2(2) + 3(1)} = \frac{-2 - 6}{4 + 3} = \frac{-8}{7}$$

$$m = -\frac{8}{7}$$

Equation of tangent = ?

$$y - y_1 = m(x - x_1)$$

$$y - 2 = m(x - 1)$$

$$y - 2 = -\frac{8}{7}(x - 1)$$

$$7(y - 2) = -8x + 8$$

$$7y - 14 = -8x + 8$$

$$7y + 8x - 22 = 0$$

Equation of normal

$$y - y_1 = -\frac{1}{m}(x - x_1)$$

$$y - 2 = \frac{7}{8}(x - 1)$$

$$8(y - 2) = 7(x - 1)$$

$$8y - 16 = 7x - 7$$

$$8y - 7x - 9 = 0$$

Maths Assignment Answer

1) $y - 3x - 2 = 0$ and $3y + x + 9 = 0$.

Solution

~~$y - 3x - 2 = 0$~~ If $m_1 m_2 = -1$, the lines are perpendicular.

$$y - 3x - 2 = 0$$

make y subject of formula:

$$y = 3x + 2$$

$$y = mx + c$$

$$m_1 = 3, \quad c = 2$$

$$3y + x + 9 = 0$$

make y subject of formula

$$3y = -x - 9$$

$$y = \frac{-x - 9}{3}$$

$$y = \frac{-x}{3} - 3$$

$$y = mx + c$$

$$m_2 = -\frac{1}{3}, \quad c = -3$$

$$\text{Recall } m_1 m_2 = -1$$

$$3 \times -\frac{1}{3} = -1$$

\therefore the lines are perpendicular to each other

2) $3y - 4 = 2x + 3$ and $y - 5 = x + 6$.

Solution

$$3y - 4 = 2x + 3$$

$$3y = 2x + 3 + 4$$

$$3y = 2x + 7$$

$$y = \frac{2x}{3} + \frac{7}{3}$$

$$m_1 = \frac{2}{3}, \quad y = mx + c$$

$$y - 5 = x + 6$$

$$y = x + 6 + 5$$

$$y = x + 11$$

$$y = mx + c$$

$$m_2 = 1$$

$$\text{Recall } m_1 m_2 = -1$$

$$\frac{2}{3} \times 1 = \frac{2}{3}$$

\therefore the lines are not perpendicular to each other.