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DEPT: MBB'S

COLLEGE: MHS

COURSE CODE: MAT 104

MATRIC No: 19/MH501/182

### Assignment Answer

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

Condition: The lines will be perpendicular if  $m_1 \times m_2 = -1$

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

$$y = 3x + 2$$

$$m_1 = \frac{dy}{dx} = 3$$

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

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

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

$$m_2 = \frac{dy}{dx} = -\frac{1}{3}$$

$$\text{Since } m_1 \times m_2 = 3 \times -\frac{1}{3} = -1$$

Since  $m_1 m_2 = -1$  the two pair of lines are perpendicular to each other

$$3y - 4 = 2x + 3, \quad y - 5 = x + 6$$

Condition: The lines are perpendicular if  $m_1 \times m_2 = -1$

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

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

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

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

$$y - 5 = x + 6$$

$$y = x + 6 + 5$$

$$y = x + 11$$

$$m_2 = \frac{dy}{dx} = 1$$

Since  $m_1 m_2 \neq -1$  the two pair of lines are not perpendicular to each other

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

Condition: The lines are perpendicular if  $m_1 \times m_2 = -1$

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

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

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

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

$$m_1 = \frac{dy}{dx} = \frac{2}{3}$$

$$m_1 \times m_2 = \frac{2}{3} \times 1 = \frac{2}{3}$$

Since  $m_1 m_2 \neq -1$  the two pair of lines are not perpendicular to each other

$$y - 5 = x + 6$$

$$y = x + 6 + 5$$

$$y = x + 11$$

$$m_2 = \frac{dy}{dx} = 1$$

$$3 \quad x^2 + y^2 + 3xy - 11 = 0 \text{ at } (1, 2)$$

Solution

$$\frac{dy}{dx} (x^2 + y^2 + 3xy - 11) = 0$$

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

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

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

$$\frac{2y + 3x}{\frac{dy}{dx}} = \frac{-3y - 2x}{1}$$

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

when  $x = 1, y = 2$

$$m_1 = \frac{-3(2) - 2(1)}{2(2) + 3(1)}$$

$$m_2 = \frac{-6 - 2}{4 + 3}$$

$$m_1 = -\frac{8}{7}$$

Equation of tangent =  $y - y_1 = m(x - x_1)$

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

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

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

$$7y + 8x - 14 - 8 = 0$$

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

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

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

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

$$\text{when } x=1, y=2$$
$$m_1 = \frac{-3(2) - 2(1)}{2(2) + 3(1)}$$

$$m_1 = \frac{-6-2}{4+3}$$

$$m_1 = -\frac{8}{7}$$

i Equation of tangent =  $y - y_1 = m(x - x_1)$

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

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

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

$$7y = -7y + 8x - 14 + 8 = 0$$

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

ii Equation of normal =  $y - y_1 = \frac{1}{m}(x - x_1)$

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

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

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

$$8y - 7x - 16 + 7 = 0$$

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