

Monday - Jerumen Busue

MHS MBBS 100/101

MAT 104 assignment

19/mhs01/246

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

If perpendicular, $m_1 m_2 = -1$

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

$$y = 3x + 2$$

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

$$3y = -x - 9$$

$$y = -\frac{1}{3}x - 3$$

$$y = mx + c$$

$$m_1 = 3$$

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

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

∴ The pair of lines are perpendicular.

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

If perpendicular, $m_1 m_2 = -1$

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

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

$$3y = 2x + 7$$

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

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

$$y - 5 = x + 6$$

$$y = x + 6 + 5$$

$$y = x + 11$$

$$y = x + 11$$

$$y = mx + c$$

$$m_2 = 1$$

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

∴ The pair of lines are not perpendicular.



3) $x^2 + y^2 + 3xy - 11 = 0$ at the pt. A $x=1, y=2$

$$x^2 + y^2 + 3xy - 11 = 0$$

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

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

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

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

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

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

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

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

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

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

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

$$\Rightarrow 8x + 7y = 22$$

for normal $y - y_1 = m_2(x - x_1)$

$$m_2 = -\frac{1}{m_1} = -\frac{1}{-8/7} = 7/8$$

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

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

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

$$\Rightarrow 8y - 7x = 9$$

$$\therefore \text{Eqn of tangent} \Rightarrow 8x + 7y = 22$$

$$\text{Eqn of normal} \Rightarrow 8y - 7x = 9$$