

# MTH 104 Assignment

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MBBS

Examine whether or not they're perpendicular

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

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

$$y = 3x + 2$$

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

( $m_1$ )

$$3y = -1x - 9$$

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

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

( $m_2$ )

$$m_1 m_2 = -1$$

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

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

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

$y - 3x - 2 = 0$  and  $3y + x + 9 = 0$  are perpendicular.

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

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

$$3y = 2x + 7$$

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

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

( $m_1$ )

$$y - 5 = x + 6$$

$$y = x + 11$$

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

( $m_2$ )

$$m_1 m_2 = -1$$

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

$$m_2 = \frac{-1}{\frac{2}{3}}$$

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

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

$3y - 4 = 2x + 3$  and  $y - 5 = x + 6$  are not perpendicular

(3) Find the tangent and normal of the curve  $x^2 + y^2 + 3xy - 11 = 0$  at  $(1, 2)$

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

$$2x + 2y \frac{dy}{dx} + 3(x \frac{dy}{dx} + yx1) - 0 = 0$$

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

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

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

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

$$x = 1 \quad y = 2$$

$$m = \frac{-(2(1) + 3(2))}{2(2) + 3(1)} = \frac{-(2 + 6)}{4 + 3} = \frac{-8}{7}$$

$$m = -8/7$$

For equation of tangent

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

$$y - 2 = \frac{-8x}{7} + \frac{8}{7}$$

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

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

$$\boxed{7y + 8x - 22 = 0}$$

For equation of normal

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

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

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

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

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

$$\boxed{8y - 7x - 9 = 0}$$