

Mathematics Assignment  
 NAME: MEBOT BAYELUM EMICHA  
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1.  $y - 3x - 2 = 0$  and  $3y + x + 9 = 0$ . Find if  $\perp$  or not

Find slope of both equation

eqn 1:  $y - 3x - 2 = 0$   
 $y = 3x + 2$   
 $y = mx + c$   
 $m = 3$

eqn 2:  $3y + x + 9 = 0$

$3y = -x - 9$   
 $y = -\frac{1}{3}x - 3$   
 $y = mx + c$   
 $m_2 = -\frac{1}{3}$

$m_1 = -\frac{1}{m_2} \text{ (}\perp\text{)}$

$\therefore$  Equation  $y - 3x - 2 = 0$  and  $3y + x + 9 = 0$  are perpendicular

2.  $3y - 4 = 2x + 3$  and  $y - 5 = x + 6$ . Find if  $\perp$  or  $\parallel$

Find the slope of both equation

eqn 1:  $3y - 4 = 2x + 3$

$3y = 2x + 3 + 4$

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

eqn 2:  $m = \frac{2}{3}$

eqn 2:  $y - 5 = x + 6$

$y = x + 6 + 5$

$y = x + 11$

$m = 1$

$m_1 \neq m_2$   $m_1 \neq \frac{1}{m_2}$

$\therefore$  Equation 1 and 2 are neither perpendicular or parallel

3  $x^2 + y^2 + 3xy - 11 = 0$  at the point  $x=1$   $y=2$   
 solution

Find the slope = differentiation of the above equation

$$\frac{dy}{dx} \Big|_{1,2} = 2x + 2y \frac{dy}{dx} + 3x \frac{dy}{dx} + 3y = 0$$

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

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

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

$$\frac{dy}{dx} \Big|_{(1,2)} = \frac{-(2(1) + 3(2))}{2(2) + 3(1)}$$

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

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

a) Equation of the tangent to a curve

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

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

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

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

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

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

$8x + 7y - 22 = 0$  which gives the equation of the tangent

b) Equation of the normal to a curve

$$y - y_1 = -1/m (x - x_1)$$

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

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

$$y - 2 = 7/8 x - 7/8$$

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

$8y - 7x + 9 = 0$  which gives the equation of the normal