Recall, $y = mx + c$ (2)

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

$m_1 m_2 = -1$ (~~wh~~ perpendicular)

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

$m_1 m_2 = -1$

$\therefore$ The lines $y - 3x - 2 = 0$ and $3y + x + 5 = 0$ are perpendicular

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

$3y - 4 = 2x + 3$ .... equ 1

make y the subject:

$3y = 2x + 3 + 4 \quad \therefore 3y = 2x + 7$

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

Recall, $y = mx + c$

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

$y - 5 = x + 6$

make y the subject of the formular

$y = x + 6 + 5 \quad \therefore y = x + 11$

from $y = mx + c$

$m_2 = 1$

3

$m_1 m_2 = -1$ (for perpendicular)

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

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

$\therefore$ The lines: $3y - 4 = 2x + 3$ and $y - 5 = x + 3$ are not perpendicular.

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

$x = 1 ; y = 2$

$m = dy/dx$

$x^2 + y^2 + 3xy - 11 = 0$ [Differentiate using implicit method]

$2x + 2y\, dy/dx + 3[x \cdot dy/dx + y \cdot 1] - 0 = 0$

$2x + 2y\, dy/dx + 3x\, dy/dx + y - 0 = 0$

$2x + 2y\, dy/dx + 3x\, dy/dx + 3y = 0$

$2y\, dy/dx + 3x\, dy/dx = -2x - 3y$

$dy/dx\, [2y + 3x] = -2x - 3y$

$$\frac{dy/dx\,[2y + 3x]}{2y + 3x} = \frac{-2x - 3y}{2y + 3x}$$

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

For the equation of tangent

$m_1 = dy/dx \Big|_{x = x_1}$

$$dy/dx = \frac{-2(1) - 3(2)}{2(2) + 3(1)}$$

$$dy/dx = \frac{-2 - 6}{4 + 3}$$

$m_1 = dy/dx = -8/7$

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

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

Multiply both sides by 7

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

$7y - 14 = -8(x - 1)$

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

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

$7y + 8x - 22 = 0$ [equation of tangent]

~~For the eq~~

For the equation of normal:

$m_1 m_2 = -1$

Where $m_1 = 8/7$

$-8/7\, m_2 = -1$

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

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

$$m_2 = \frac{7}{8}$$

Name: [illegible] (2)

Matric no: [illegible]

Course: MAT 104

Department: Medicine and Surgery.

Solution to Assignment.

1. Examine whether or not these pair of lines are perpendicular to each other.

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

Solution:

The equation of a straight line is expressed as $y = mx + c$ gradient "m" has, $y = m_1x + c_1$ and $y = m_2x + c_2$ are perpendicular if $m_1m_2 = 1$

$y - 3x - 2 = 0$

make y the subject of the formular,

$y = 3x + 2$

Recall, $y = mx + c$

$m_1 = 3$

$3y + x + 9 = 0$

Make y the subject of formular

$3y + x + 9 = 0$

$3y = -x - 9$

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

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

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

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

multiply by 8 (both sides)

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

$\therefore 8y - 16 = 7(x - 1)$ $\quad \therefore 8y - 16 = 7x - 7$

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

$8y - 9 - 7x = 0$

$8y - 7x - 9 = 0$

$\therefore 8y - 7x - 9 = 0$ [equation of the normal]