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19/MHS01/358.
MEDICINE AND SURGERY.
MATH 104 ASSIGNMENT.

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

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

for the lines to be perpendicular then $m_1m_2=-1$

$y-3x-2=0$

Making y the subject of the formula.

$y=+3x+2$

$y=3x+2$

By comparison with $y=mx+c$

$m_1=3$

$3y+x+9=0$

Making y the subject of formula.

$3y=-x-9$

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

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

$y=mx+c$ and $m_2=-1/3$

$m_1m_2=3\times -1/3=-1$

Since $m_1m_2=-1$ then the lines $y-3x-2=0$ and $3y+x+9=0$ are perpendicular.

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

Let $3y-4=2x+3$ ——— (1)

and $y-5=x+6$ ——— (2)

Making y the subject of formula in 1

$3y=2x+3+4$

$3y=2x+7$

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

By comparing with $y=mx+c$, then $m_1=\frac{2}{3}$

For equation (2)

Making y the subject of formula,

$y=x+6+5$

$y=x+11$

By comparing with $y=mx+c$ then, $m_2=1$

But for the lines to be perpendicular,

$m_1m_2=-1$

~~$m_1m_2=2/3\times1\neq1$~~

But $m_1m_2=2/3\times1=2/3$

Therefore $m_1m_2\neq-1$

Hence the lines $3y-4=2x+3$ and $y-5=x+6$ are NOT PERPENDICULAR

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

$$= 2x + 2y\frac{dy}{dx} + 3\left[x\frac{dy}{dx} + y\right] - 0 = 0$$

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

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

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

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

m at the point $x=1$ and $y=2$

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

$$m = \frac{-8}{7} \text{ or } -1\tfrac{1}{7}$$

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

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

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

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

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

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

b) Equation of normal,

$$m = \frac{-1}{-8/7} = +1 \times \frac{7}{+8}$$

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

$$y - y_1 = \frac{7}{8}(x - x_1)$$

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

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

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

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

$$8y - 7x - 9 = 0 \quad \text{(Equation of normal)}$$