GALAWU-ERIH ELIZABETH

19/MHS01/393

Medicine and Surgery 07/04/2020

MAT 104

Assignment

Examine whether or not these pairs of lines are perpendicular to each other:-

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

Sol →

$y-3x-2=0$

$y=3x+2$

$[y=mx+c]^*$

$\therefore M_1 = 3$

$3y+x+9=0$

$3y=-x-9$

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

$\therefore M_2 = -\frac{1}{3}$

Recall $M_1 \times M_2 = 3 \cdot -\frac{1}{3} = -1$

The Pairs of lines are ∴ perpendicular as $3 \cdot -\frac{1}{3} = -1$ // ($y-3x-2=0$ is perpendicular to $3y+x+9=0$)

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

Sol →

$3y-4=2x+3$

$3y=2x+3+4$

$3y=2x+7$

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

$\therefore M_1 = \frac{2}{3}$

$y-5=x+6$

$y=x+6+5$

$y=x+11$

$\therefore M_2 = 1$

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(CONTINUATION)

The pairs of lines are therefore "not" perpendicular as
$M_1 \times M_2 \rightarrow \frac{2}{3} \times 1 = \frac{2}{3}$
$(3y-4=2x+3$ is not perpendicular to $y-5=x+6)$

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

SOL →

$$2x+2y\frac{dy}{dx}+3\left(x\times\frac{dy}{dx}+y\times 1\right)-0=0$$

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

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

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

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

When $x=1$ and $y=2$

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(continuation)

$$M = \frac{-[2(1)+3(2)]}{2(2)+3(1)}$$

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

$\therefore M = -8/7$

Equation of the tangent to a curve:-

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

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

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

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

$$8x + 7y - 22 = 0$$

$\therefore$ equation of tangent to a curve = $8x + 7y - 22 = 0$

Equation of the normal to a curve:-

$$y - y_1 = \frac{-1}{m}(x - x_1)$$

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

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

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

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

$$8y - 7x - 9 = 0$$

$\therefore$ equation of normal to a curve = $8y - 7x - 9 = 0$