Name Oloruntogbe Clement Damilekan
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Question & Answer

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

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

N.B:- For them to be perpendicular to each other the product of the slopes of the two lines will be -1

Since $m \cdot -\frac{1}{m} = -1$ where $m_1 = m$ and $m_2 = -\frac{1}{m}$

$\therefore$

$y = 2+3x$

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

$m = 3$

$3y = -9 - x$

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

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

$\frac{dy}{dx} = m_2 = 0 - \frac{1}{3}$

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

The product $= 3 \cdot -\frac{1}{3} = -1$

$\therefore$ The two line are perpendicular.

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

$3y = 2x + 3 + 4$

$3y = 2x + 7$

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

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

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

$y - 5 = x + 6$

$y = x + 6 + 5$

$y = x + 11$

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

Product of the two slopes $= \frac{2}{3} \cdot 1 = \frac{2}{3}$

$\therefore$ The two lines are not perpendicular.

3 Find the equations of tangent and normal to the Curve $x^2+y^2+3xy-11=0$ at Point $x=1$ and $y=2$.

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

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

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

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

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

~~$m=2x+$~~

$m=\frac{-2-3}{2+3}$

$m=\frac{-5}{5}$

$m=-1$

$x_1=1$ and $y_1=2$

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

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

$y-2=-x+1$

$y=-x+3$ (equation of a tangent)

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

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

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

$y - 2 = x - 1$

$y = x + 1$ (equation of a normal)