UHANNA NJEOMA GLEM
19/MHS01/413
MATHEMATICS ASSIGNMENT.

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

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

Sol

For 2 lines to be perpendicular to each other, $M_1 M_2 = -1$

$y - 3x + 2 = 0$

$y = 3x + 2$

$y = mx + c$

So $m_1 = 3$.

Also, $3y + x + 9 = 0$.

$3y = -x - 9$

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

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

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

Since $m_1 m_2 = -1$, the pair of lines $y - 3x - 2 = 0$ and $3y + x + 9 = 0$ are said to be perpendicular to each other.

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

Sol

$3y = 2x + 3 + 4$

$3y = 2x + 7$

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

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

$y - 5 = x + 6$

$y = x + 6 + 5$

$y = x + 11$

$m_2 = 1$

$\therefore m_1 m_2 = -1$

$\frac{2}{3} \cdot 1 = 1 \quad (\neq -1)$

They are not perpendicular to each other.

19/MMSol/415.

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

$2x+2y\frac{dy}{dx}+3x\frac{dy}{dx}+1y\cdot 1)-0=0$.

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

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

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

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

$m_1=\frac{dy}{dx}=\frac{-2(1)-3(2)}{2(2)+3(1)}=\frac{-8}{7}$

$m_1=-8/7$

eqn of tangent, $M_1=m_2$

$y-y_1=m_1(x-x_1)$.

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

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

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

$7y+8x-22=0$ -> Equation of the tangent

For normal $M_2=-1/m_1$

$y-y_1=-1/m_1(x-x_1)$

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

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

$8y-16=7x-7$

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

$8y-7x-9=0$. -> Equation of the normal.