Name:- Mylega Blessing Ebelechukwu
Matric no:- 19/MHS01/249
Department:- NURS
College:- MHS Serial no:- 285

4. Examine whether or not these pair of lines are perpendicular to each other
(a) $y-3x-2=0$ and $3y+x+9=0$ (b) $2y-4=2x+3$ and $y-5=x+6$
(b) Find the equations of the tangent and normal to the curve $x^2+y^2-2xy-11=0$ at the point $x=1, y=2$.

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

$3y+x+9=0$

making y the subject of the formular

$y=3x+2$ (by comparison with $y=mx+c$

$m_1=3$

$3x+x+9=0$

making y the subject of the formular

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

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

$y=mx+c$, $m_2=\frac{-1}{3}$

$m_1m_2=-1$

$3\times\frac{1}{3}=-1$ Since $m_1m_2=-1$, then the lines $y-3x-2=0$ and $3y+x+9=0$ are a Perpendicular

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

let $A=2y-4=2x+3$, let B be $y-5=x+6$

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

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

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

$B=\frac{dy}{dx}=\div 0=1+0$

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

$A\neq B$

Then $2y-4=2x+3$ and $y-5=x+6$ are not perpendicular

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

dy/dx

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

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

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

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

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

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

$m=dy/dx\,/\,x=1,y=2 \quad =\frac{-2(1)-3(2)}{2(2)+3(1)}=\frac{-2-6}{4+3}=-\frac{8}{7}$

Equation of tangent

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

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

$7(y-2)=-8(x-1) \quad =7y-14=-8x+8$

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

$8x+7y-22=0$

Equation of the normal of a curve

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

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

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

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

$8y-16=7x-7$

Collect like terms

$8y=7x-7+16$

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

$7x-8y+9=0$