$m_1 m_2 = -1$

$-\frac{8}{7} m_2 = -1$

$\therefore \quad m_2 = 7/8$

$y - y_1 = m_2 (x - x_1)$

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

$y - 2 = 7x/8 - 7/8$

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

$8y - 16 = 7x - 7$

$8y - 7x - 9 = 0$ eqn of normal

$x^2+y^2+3xy-11=0$ at point $(1,2)$

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

$2x+2y\,dy/dx+3(x\,dy/dx+y)=0$

$2x+2y\,dy/dx+3x\,dy/dx=-2x-3y$

$dy/dx(2y+3x)=-2x-3y$

$(2y+3x)$ $\quad 2y+3x$

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

$\therefore dy/dx\,|x=1,y=2 \quad \frac{-2(1)-3(2)}{2(2)+3(1)}$

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

$\therefore dy/dx=-8/7$

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

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

$y-2=\frac{8}{7}+8/7$

$y-2=\frac{-8x+8}{7}$

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

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

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

$7y+8x-22=0$ eqn of tangent

Class:

Name: Okwuma Dumebi Kizito
Mat: 19/MHS01/328
Curse: MATH 104 MBBS

K Examine whether of not these pair of lines are perp to each other

(1) $Y - 3x - 2 = 0$ and $3y + x + 9 = 0$
(2) $3y - t = 2x + 3$ and $y - 5 = x + 6$
(3) Find the equations of the tangent and normal to the C $x^2 + y^2 + 3xy - 11 = 0$ at $(1, 2)$

Ans

(1) $y - 3x - 2 = 0$

rearrage into the form, $y = mx + c$

$y = (3)x + 2$

$\therefore m_1 = 3$,

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

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

$y = \left(\frac{-1}{3}\right)x - 3 \quad m_2 = -\frac{1}{3}$

$\therefore m_1 m_2 = ?$

$3 \times -\frac{1}{3} = -1$ $\therefore$ The lines are perpendicular

$(m_1 m_2 =$

$y = x + 1$

$y = mx + c$

$y = 1$

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

$\therefore m_1 m_2 \neq 1$

Hence the lines are not perpendicular

(3) $x^2 + y^2 + 3xy - 11 = 0$ at point $(1, 2)$

solution

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

$2x + 2y\, dy/dx + 3(x\, dy/dx + y) = 0$

$2x + 2y\, dy/dx + 3x\, dy/dx = -2x - 3y$

$dy/dx\,(2y + 3x) = -2x - 3y$

$\frac{(2y + 3x)}{2y + 3x}$

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

$\therefore dy/dx \,|\, x = 1, y = 2$

$\frac{-2(1) - 3(2)}{2(2) + 3(1)}$

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

$\therefore dy/dx = -8/7$

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

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

$y - 2 = \frac{-8}{7} + 8/7$

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

Ans

(1) $y-3x-2=0$

Rearrange into the form, $y=mx+c$

$y=(3)x+2$

$\therefore m_1=3$ //

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

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

$y=\left(\frac{-1}{3}\right)x-3 \quad m_2=-\frac{1}{3}$

$\therefore m_1 m_2 = ?$

$3\times -\frac{1}{3}=-1$ $\therefore$ The lines are perpendicular //

$(m_1 m_2=-1)$

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

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

$y=\left(\frac{2}{3}\right)x+\frac{7}{3} \quad m_1=x$ //

$y=mx+c$

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

$y-5=x+6$

$y=x+6+5$