MAT 104 ASSIGNMENT

19/MHS01/407

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

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

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

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

Solv

1 $y - 3x - 2 = 0$

$3y + x + 9 = 0$

Let $A = y - 3x - 2 = 0$

$B = 3y + x + 9 = 0$

$\frac{dy}{dx} = -3$ $\frac{dA}{dx} = -3 - 0$, $\frac{dy}{dx} = -3 = 0 \therefore \frac{dA}{dx} = 3$

differentiating B

$3\frac{dy}{dx} + 1 + 0 = 0$

$\frac{dy}{dx} = -1/3$

A + B

i.e $y - 2x - 2 = 0$ is perpendicular to $3y + x + 9 = 0$

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

$y - 5 = x + 6$

Re arrage

$3y - 2x - 4 - 3 = 0$, $3y - 2x - 7 = 0$

$y - x - 5 - 6 = 0$, $y - x - 11 = 0$

Let $A = 3y - 2x - 7 = 0$

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

Let $B = y - x - 11 = 0$

$\frac{dy}{dx} - 1 + 0 = 0$

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

$\therefore 3y - 4 = 2x + 3$ is not perpendicular to $y - 5 = x + 6$

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

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

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

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

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

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

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

$-1\div\frac{-8}{7}$

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

when $x=1$ and $y=2$

$$m=\frac{-(2(1)+3(2))}{2(2)+3(1)}=\frac{-(2+6)}{4+3}=\frac{-8}{7}$$

Equation of the tangent to a Curve

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

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

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

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

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

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

Equation of the normal to a Curve

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

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

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

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

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

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

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