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MAT104 Assignment
19/MHS01/156

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

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

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

3 Find the equation to the tangent and normal to the curve $x^2+y^2+3xy-11=0$ at the point $x=1\ y=2$

Solution

1 ~~$y=$~~ $y-3x-2=0$ & $3y+x+9=0$

Let ~~$y=$~~ $y=3x+2$

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

$\therefore m_1=3$

$3y=-x-9$

$3\,dy/dx=-1$

$3m_2=-1$

$m_2=-1/3$

Since $\frac{m_1}{m_2}=-1$ Hence they are perpendicular

2 $3y - 4 = 2x + 3$ $\quad$ $y - 5 = x + 6$

$3y = 4 + 2x + 3$ $\quad$ $y = x + 6 + 5$

$3\,dy/dx = 2$ $\quad$ $\frac{dy}{dx} = 1$

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

$\therefore m_1 = 2/3$ $\quad$ $m_2 = 1$

Since $m_1 \neq \frac{1}{m_2}$ These Ones are not perpendicular

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

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

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

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

$2x^2 + 2y\,dy/dx + 3x\,dy/dx + 3y - 0 = 0$

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

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

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

where $x = 1 \quad y = 2$

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

$m = -8/7$ //

For Equation of the tangent

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

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

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

$7y = -8x + 22$

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

For Equation of the Normal

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

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

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

$8y - 16 = 7x - 7$

$8y = 7x + 9$

~~$y = \frac{7x}{8}$~~

$y = 7/8x + 9/8$