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19/MHS01/212
MBBS
MAT 104

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

N.B ⇒ for them to be perpendicular the product of the slope of the two lines will be -1, Since $m = -1/m = -1$

$y = 2 + 3x$

$dy/dx = 3$

$m = 3$

$3y = -9 - x$

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

$y = -3 - x/3$

$dy/dx \; m_2 = 0 - 1/3$

$m_2 = -1/3$

The product = -1

$3 \times -1/3 = -1$ [The lines are perpendicular]

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

$3y = 4x + 3x + 4$

$\frac{3y}{3} = \frac{2x}{3} + \frac{9}{3}$

$y = 2x/3 + 3$

$dy/dx = 2/3$

$m_1 = 2/3$

$y - 5 = x + 6$

$y = x + 6 + 5$

$y = x + 11$

$dy/dx = 1$

$m_2 = 1$

Product of the two lines = $2/3 \cdot 1 = 2/3$

[The two lines not perpendicular]

3) Find the equations of tangent & normal $x^2 + y^2 + 3x + y - 11 = 0$ and point $x = 1, y = 2$.

Solution.

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

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

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

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

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

$m = -5/5 = -1$

$x_1 = 1, \; y_1 = 2$

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

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

$y - 2 = -x + 1$

$y + x = 2 + 1$

$y + x = 3$

$y + x - 3 = 0$ [Equation of tangent]

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

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

$-y + 2 = -x + 1$

$-y + x = -2 + 1$

$-y + x = -1$

$y + x + 1 = 0$ [Equation of the normal].