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Assignment 8

Matric no: 19/MHS 01/313

Department: M.B.B.S

Course Code: MAT 104

Find the Curves in problem 1 to 5, at the points given, find (a) the equation of the tangent, and (b) the equation of the normal.

1)  $Y = 2x^2$  at the point  $(1, 2)$

$$x_1 = 1, y_1 = 2$$

$$\frac{dy}{dx} = 4x$$

$$m = \frac{dy}{dx} / x = x_1 = 1 \therefore m = 4(1) = 4$$

To find the equation of the tangent

$$Y - Y_1 = m(x - x_1)$$

$$Y - 2 = 4(x - 1)$$

$$Y - 2 = 4x - 4$$

$$Y - 4x = -4 + 2$$

$$Y - 4x = -2$$

$$Y - 4x + 2 = 0$$

To find the equation of the normal

$$m_1 m_2 = -1$$

$$4m_2 = -1$$

$$m_2 = -\frac{1}{4}$$

$$Y - Y_1 = m(x - x_1)$$

$$Y - 2 = -\frac{1}{4}(x - 1)$$

$$4(Y - 2) = -1(x - 1)$$

$$4Y - 8 = -x + 1$$

$$4Y + x = 8 + 1$$

$$4Y + x = 9$$

$$4Y + x - 9 = 0$$

2  $Y = 3x^2 - 2x$  at point  $(2, 8)$

Solution:  $x_1 = 2, Y_1 = 8$

$$\frac{dy}{dx} = 6x - 2$$

$$m = \frac{dy}{dx} \bigg|_{x=2} = 6(2) - 2 = 10$$

To find the equation of the tangent,

$$Y - Y_1 = m(x - x_1)$$

$$Y - 8 = 10(x - 2)$$

$$Y - 8 = 10x - 20$$

$$Y - 10x = 8 - 20$$

$$Y - 10x = -12$$

$$Y - 10x + 12 = 0$$

To find the equation of the normal

$$m_1 m_2 = -1$$

$$10 m_2 = -1/10$$

$$Y - Y_1 = m(x - x_1)$$

$$Y - 8 = -1/10(x - 2)$$

$$10(Y - 8) = -1(x - 2)$$

$$10Y - 80 = -x + 2$$

$$10Y + x = 80 + 2$$

$$10Y + x = 82$$

$$10Y + x - 82 = 0$$

3  $Y = \frac{x^3}{2}$  at the point  $(-1, -\frac{1}{2})$

Solution:  $x_1 = -1, Y_1 = -\frac{1}{2}$

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

$$m = \frac{dy}{dx} \bigg|_{x=-1} = \frac{3(-1)^2}{2} = \frac{3}{2}$$

$$m = \frac{3(-1)^2}{2} = \frac{3 \times 1}{2} = \frac{3}{2}$$

To find the equation of the tangent

$$Y - Y_1 = m(x - x_1)$$

$$Y - (-\frac{1}{2}) = \frac{3}{2}(x - (-1))$$

$$Y + \frac{1}{2} = \frac{3}{2}(x + 1)$$

$$2(Y + \frac{1}{2}) = 3(x + 1)$$

$$2Y + 1 = 3x + 3$$

$$2Y - 3x = 3 - 1$$

$$2Y - 3x = 2$$

$$2Y - 3x - 2 = 0$$



To find the equation of the normal,

$$m_1 m_2 = -1$$

$$\frac{3}{2} m_2 = -1$$

$$m_2 = -1 \times \frac{2}{3} = -\frac{2}{3}$$

$$Y - Y_1 = m(x - x_1)$$

$$Y - (-\frac{1}{2}) = -\frac{2}{3}(x - (-1))$$

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

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

$$3Y + \frac{3}{2} = -2x - 2$$

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

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

$$2(3y + 2x) = -7$$

$$6y + 4x + 7 = 0 \quad \text{or}$$

$$3y + 2x + \frac{7}{2} = 0$$

4  $Y = 1 + x - x^2$  at the point  $(-2, -5)$

Solution:  $x_1 = -2, Y_1 = -5$

$$\frac{dY}{dx} = 1 - 2x$$

$$m = \frac{dY}{dx} \Big|_{x=-2} = 1 - 2(-2) = 5$$

$$m = 1 - 2(-2) = 5$$

To find the equation of the tangent,

$$Y - Y_1 = m(x - x_1)$$

$$Y - (-5) = 5(x - (-2))$$

$$Y - (-5) = 5(x - (-2))$$

$$Y - (-5) = 5(x - (-2))$$

$$Y + 5 = 5(x + 2)$$

$$Y - (-5) = 5(x - (-2))$$

$$Y + 5 = 5x + 10$$

To find the equation of the normal

$$m_1 m_2 = -5$$

$$5m_2 = -1$$

$$m_2 = -\frac{1}{5}$$

$$Y - Y_1 = m(x - x_1)$$

$$5Y + 25 = -x - 2$$

$$Y - (-5) = -\frac{1}{5}(x - (-2))$$

$$5Y + 25 = -x - 2$$

$$Y + 5 = -\frac{1}{5}(x + 2)$$

$$5Y + x = -2 - 25$$

$$5(Y + 5) = -1(x + 2)$$

$$5Y + x + 27 = 0$$

$$5Y + 25 =$$

5  $Y = \frac{1}{x}$  at the point  $(3, \frac{1}{3})$

Solution:  $x_1 = 3, y_1 = \frac{1}{3}$

$$Y = x^{-1}$$

$$\frac{dY}{dx} = -x^{-2}$$

$$m = \frac{dY}{dx} \bigg|_{x=3} = -\frac{1}{9}$$

$$m = -3^{-2} = -\frac{1}{9}$$

To find the equation of the tangent

$$Y - Y_1 = m(x - x_1)$$

$$Y - \frac{1}{3} = -\frac{1}{9}(x - 3)$$

$$9(Y - \frac{1}{3}) = -1(x - 3)$$

$$9Y - 3 = -x + 3$$

$$9Y + x = 3 + 3$$

$$9Y + x = 6$$

$$9Y + x - 6 = 0$$

To find the equation of the normal

$$m_1 m_2 = -1$$

$$-\frac{1}{9} m_2 = -1$$

$$m_2 = 9$$

$$Y - Y_1 = m(x - x_1)$$

$$Y - \frac{1}{3} = 9(x - 3)$$

$$Y - \frac{1}{3} = 9(x - 3)$$

$$Y - \frac{1}{3} = 9x - 27$$

$$Y - 9x = -27 + \frac{1}{3}$$

$$Y - 9x = -\frac{80}{3}$$

$$3(Y - 9x) = -80$$

$$3Y - 27x + 80 = 0 \quad \text{or}$$

$$Y - 9x + \frac{80}{3} = 0$$