

(1)

Tangential Eqn :

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

$$y = 4x - 2$$

Normal Eqn :

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

$$4y = 9 - x$$

$$4y = -x + 9$$

$$y = \frac{-x}{4} + \frac{9}{4}$$

(2)

Tangential Eqn :

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

$$y = 10x - 12$$

Normal Eqn :

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

$$10y = -x + 82$$

$$y = \frac{-x}{10} + 8.2$$

(3)

$$y = \frac{y^3}{3}$$

$$y' = \frac{3x^2}{1}$$

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

at point  $-1$ ,  $y' = \frac{3(-1)^2}{2} = \frac{3}{2} = 1.5$

Tangent line eqn,  $y - y_1 = m(x - x_1)$

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

$$2(y + 1/2) = 3(x + 1)$$

$$2y + 1 = 3x + 3$$

$$2y = 3x + 3 - 1$$

$$2y = 3x + 2$$

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

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

$$y = \frac{3x}{2} + 1 \quad \parallel$$

Normal Eqn ;

$$m_1 \cdot m_2 = -1$$

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

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

$$y - y_1 = -\frac{2}{3}(x - x_1)$$

$$y + 1/2 = -\frac{2}{3}(x + 1) \quad ; \text{Cross multiply}$$

$$3(y + 1/2) = -2(x + 1)$$

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

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

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

$$y = \frac{-2x}{3} - \left(\frac{7}{2} \times \frac{1}{3}\right)$$

$$y = \frac{-2x}{3} - \frac{7}{6} \quad \parallel$$

(4)

$$y = 1 + x - x^2$$

$$\frac{dy}{dx} = 1 - 2x \equiv m \quad \left| \quad \begin{array}{l} \text{at } x = -2, m = 1 - 2(-1) \\ = 1 + 4 \\ = 5 \end{array} \right.$$

Equation of tangent :

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

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

$$y + 5 = 5x + 10$$

$$y = 5x + 10 - 5$$

$$y = 5x + 5 \quad \parallel$$

Equation of normal :

$$\text{Recall, } m_1 m_2 = -1$$

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

$$y - y_1 = -\frac{1}{5}(x - x_1)$$

$$y + 5 = -\frac{1}{5}(x + 2) \quad ; \text{ Cross multiply}$$

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

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

$$5y = -x - 2 - 25$$

$$5y = -x - 27$$

$$y = \frac{-x}{5} - \frac{27}{5}$$

$$y = \frac{-x - 27}{5} \quad \parallel$$

(5)

$$y = 1/x \text{ at } p(3, 1/3)$$

$$\frac{dy}{dx} = -x^{-2} \equiv m \quad \left| \begin{array}{l} \text{m at} \\ \text{max } x=3 \Rightarrow -3^{-2} \end{array} \right.$$

$$\text{Tangent Equation:} \quad = \frac{1}{9}$$

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

$$y - 1/3 = 1/9(x - 3) \quad ; \text{ Am multiply}$$

$$9(y - 1/3) = x - 3$$

$$9y - 3 = x - 3$$

$$9y = x - 3 + 3$$

$$9y = x$$

$$y = \frac{x}{9} \quad \parallel \parallel \parallel$$

Normal Equation:

Recall,  $m_1 m_2 = -1$

$$m_2 = -1/m_1 = -1/(1/9) = -9$$

$$m_2 = -9$$

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

$$\cancel{y - 1/3} = -9(x - 3)$$

$$y - 1/3 = -9x + 27 \quad 3y - 1 = -27(x - 3)$$

$$\cancel{y} = -9x + 27 + 1/3 \quad 3y - 1 = -27x + 81$$

$$y = -9x + \frac{82}{3}$$

$$3y = -27x + 81 + 1$$

$$3y = -27x + 82$$

$$y = \frac{-27x + 82}{3}$$

$$y = -9x + \frac{82}{3} \quad \parallel \parallel \parallel$$