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MATH W4 ASSIGNMENT

① $y = 2x^2$ at point (1, 2)

$$\frac{dy}{dx} = 4x$$
$$m = \frac{dy}{dx} \Big|_{x=1}$$

$$\therefore m = 4(x) = 4(1) = 4$$

② \Rightarrow Eqn of straight line:

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

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

$$y - 2 = 4x - 4$$

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

\therefore Eqn of tangent = $y - 4x + 2 = 0$

③ \Rightarrow Eqn of normal

$$m = 4$$

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

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

$$y - 2 = \frac{-1}{4}x + \frac{1}{4}$$

$$y - 2 = \frac{-x + 1}{4}$$

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

$$4y - 8 + x - 1 = 0$$

\therefore Eqn of normal = $4y + x - 9 = 0$

② $y = 3x^2 - 2x$ at point $(2, 8)$

$$y = 3x^2 - 2x$$

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

$$m = \left. \frac{dy}{dx} \right|_{x=2}$$

$$m = 6(2) - 2 = 10$$

② Eqn of tangent:

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

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

$$y - 8 = 10x - 20$$

$$y - 8 - 10x + 20 = 0$$

$$y - 10x + 20 - 8 = 0$$

$$\therefore \text{Eqn of tangent} = y - 10x + 12 = 0$$

③ Eqn of normal:

$$m = 10$$

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

$$y - 8 = \frac{-1}{10}(x - 2)$$

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

$$10y - 80 + x - 2 = 0$$

$$\text{Eqn of normal} = 10y + x - 82 = 0$$

⑤ $y = x^2/2$ at point $(-1, -1/2)$

$$y = \frac{x^2}{2}$$

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

$$m = \left. \frac{dy}{dx} \right|_{x=-1}$$

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

② Eqn of tangent

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

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

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

$$y + 1/2 = 2x + 2$$

$$y - 2x + 1/2 - 2 = 0$$

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

$$\therefore \text{Eqn of tangent} = y - 2x - \frac{3}{2} = 0$$

③ Eqn of normal

$$m = 2$$

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

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

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

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

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

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

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

$$y + 1/2 = \frac{-x - 1}{2}$$

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

$$2y + 1 + x + 1 = 0$$

$$\text{Eqn of normal} = 2y + x + 2 = 0$$

-1/2)

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

Soln

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

$$\frac{dy}{dx} = -2x + 1$$

$$m = \frac{dy}{dx} \Big|_{x=-2} \quad \checkmark -2(-2)+1$$

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

① Eqn of tangent

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

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

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

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

$$y + 5 - 5x - 10 = 0$$

$$\text{Eqn of tangent} = y - 5x - 5 = 0$$

② Eqn of normal

$$m = 5$$

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

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

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

$$y + 5 = \frac{-1}{5}x - \frac{2}{5}$$

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

$$5y + 25 + x + 2 = 0$$

$$\text{Eqn of normal} = 5y + x + 27 = 0$$

⑤ $y = 1/x$ at point $(3, 1/3)$

Soln

$$y = 1/x = x^{-1}$$

$$\frac{dy}{dx} = -1x^{-2}$$

$$m = \frac{dy}{dx} \Big|_{x=3}$$

$$m = -1(3)^{-2} = -1/9$$

① Eqn of tangent

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

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

$$y - 1/3 = -1/9x + 1/3$$

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

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

$$\therefore \text{Eqn of tangent} = 9y + x - 6 = 0$$

② Eqn of normal

$$m_1 m_2 = -1$$

$$-1/9 m_2 = -1$$

$$m_2 = -1 / -1/9 = 9$$

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

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

$$y - 1/3 = 9x - 27$$

$$y - 9x = -26\frac{2}{3}$$

$$y - 1/3 = 9x - 27$$

$$\therefore \text{Eqn of normal} = y - 9x + 80\frac{1}{3} = 0$$

or

$$y - 9x + 26\frac{2}{3} = 0$$