

## Exercises Chapter 1

19/11/2011/169

MBBS

1)  $y = 2x^2; (1, 2)$

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

$$\left. \frac{dy}{dx} \right|_{x=1} = 4(1)$$

$$m = 4$$

Equation of tangent

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

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

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

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

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

Equation of normal

$$m_1 m_2 = -1$$

$$m_2 = \frac{-1}{m_1}; m_2 = \frac{-1}{4} = -\frac{1}{4}$$

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

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

$$4$$

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

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

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

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

Equation of normal =  $4y + x - 9 = 0$

2)  $y = 3x^2 - 2x; (2, 8)$

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

$$\left. \frac{dy}{dx} \right|_{x=2} = 6(2) - 2$$

$$m = 10$$

Equation of tangent

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

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

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

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

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

Equation of tangent =  $y - 10x + 12 = 0$  //

Equation of normal

$$m_1 m_2 = -1$$

$$m_2 = \frac{-1}{m_1} ; m_2 = \frac{-1}{10} = -1/10$$

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

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

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

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

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

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

Equation of normal =  $10y + x - 82 = 0$  //

3)  $y = x^3/2 ; (-1, -1/2)$

$$m = \frac{dy}{dx} ; \frac{x^3}{2} = x^3 \cdot 2^{-1} = 3x^2 \cdot 2^{-2}$$

$$\frac{dy}{dx} \Big|_{x=-1} ; 3(-1)^2 \cdot 2^{-2}$$

$$m = 1/4$$

Equation of tangent

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

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

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

$$4(y + 1/2) = 11(x + 1)$$

$$4y + 2 = 11x + 11$$

$$4y - 11x + 2 - 11 = 0$$

$$4y - 11x - 9 = 0$$

Equation of tangent =  $4y - 11x - 9 = 0$ ,

Equation of normal

$$m_1 m_2 = -1$$

$$m_2 = \frac{-1}{m_1} ; m_2 = \frac{-1}{11} = -1/11$$

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

$$y - (-1/2) = \frac{-1}{11}(x - (-1))$$

$$y + 1/2 = \frac{-1}{11}(x + 1)$$

$$11(y + 1/2) = -1(x + 1)$$

$$11y + 11/2 = -x - 1$$

$$11y + x + \frac{11}{2} + 1 = 0$$

$$11y + x + \frac{13}{2} = 0$$

Multiply all through by 2

$$22y + 2x + 13 = 0$$

Equation of normal =  $22y + 2x + 13 = 0$ ,

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

$$m = \frac{dy}{dx} ; x - 2x$$

$$\frac{dy}{dx} \Big|_{x=-2} ; x - 2x$$

$$(-2) - 2(-2)$$

$$m = 2$$

Equation of tangent

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

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

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

$$y + 5 = 2x + 4$$

$$y - 2x + 5 - 4 = 0$$

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

$$\text{Equation of tangent} = y - 2x + 1 = 0 //$$

Equation of normal

$$m_1 m_2 = -1 ; m_2 = -1/m_1 = -1/2$$

$$m_2 = -1/2 //$$

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

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

$$2(y + 5) = -1(x + 2) ; 2y + 10 = -x - 2$$

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

$$\text{Equation of normal} = 2y + x + 12 = 0 //$$

$$5) y = 1/x ; (3, 1/3)$$

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

$$\frac{dy}{dx} \Big|_{x=3} ; -3^{-2} = -1/9 \therefore m = -1/9 //$$

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

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

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

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

$$\text{Equation of tangent} = 9y + x - 6 = 0 //$$

Equation of normal

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

$$\therefore m_2 = 9 //$$

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

$$y - 1/3 = 9(x - 3) ; y - 1/3 = 9x - 27$$

$$y - 9x - 1/3 + 27 = 0 ; y - 9x + 80 = 0$$

Multiply all through by 3

$$3y - 27x + 80 = 0$$

$$\therefore \text{Equation of normal} = 3y - 27x + 80 = 0 //$$