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Dept: MBBs

1.  $y = 2x^2$  at a point  $(1, 2)$

Sol

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

$$m = 4(1)$$

$$m = 4$$

(a) the equation of the tangent

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

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

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

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

(b) the equation of the normal

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

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

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

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

Cross multiply

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

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

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

2.  $y = 3x^2 - 2x$  at the point  $(2, 8)$

sol

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

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

$$m = 10$$

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

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

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

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

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

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

$$y - 8 = \frac{-x + 2}{10} + \frac{2}{10}$$

$$y - 8 = \frac{-x + 2}{10}$$

Cross multiply

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

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

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

Sol  
 $y = \frac{x^3}{2} \Rightarrow 2x^{-3}$

$$\frac{dy}{dx} = -6x^{-4}$$

$$m = -6(-1)^{-4}$$

$$m = -6$$

a)  $y - y_1 = m(x - x_1)$   
 $y - (-\frac{1}{2}) = -6(x - (-1))$   
 $y + \frac{1}{2} = -6(x + 1)$

$$y + \frac{1}{2} = -6x - 6$$

$$y + 6x + \frac{13}{2} = 0$$

multiply through by 2

$$2y + 12x + 13 = 0$$

b)  $y - y_1 = \frac{1}{m}(x - x_1)$   
 $y - (-\frac{1}{2}) = \frac{1}{(-6)}(x - (-1))$

$$y + \frac{1}{2} = \frac{1}{6}(x + 1)$$

$$y + \frac{1}{2} = \frac{x}{6} + \frac{1}{6}$$

$$y + \frac{1}{2} = \frac{x+1}{6}$$

Cross multiply

$$6y + 3 = x + 1$$

$$6y - x - 2 = 0$$

$$6y - x - 2 = 0$$

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

sol.

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

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

$$m = 1 + 4 = 5$$

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

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

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

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

$$y - 5x - 5 = 0$$

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

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

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

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

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

$$5y + x + 27 = 0$$

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

$$y = \frac{1}{x} \Rightarrow x^{-1}$$

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

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

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

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

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

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

cross multiply

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

$$27y - 9 = -3x + 9$$

$$27y + 3x - 18 = 0$$