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MATH 104

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

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

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

$$= 4(1) = 4$$

For Tangent of the Curve

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

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

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

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

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

For Normal of the Curve

$$m_2 = -1/4$$

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

$$y - 2 = -1/4x + 1/4$$

$$y + 1/4x - 2 - 1/4 = 0$$

$$y + 1/4x - 9/4 = 0$$

Multiply through by 4

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

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

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

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

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

$$= 10$$

For Tangent of the Curve

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

$$y + \frac{1}{9}x - \frac{1}{3} - \frac{1}{3} = 0$$

$$y + \frac{1}{9}x - \frac{2}{3} = 0$$

Multiply through by 9

$$9y + x - 6 = 0 //$$

for Normal of the curve

$$m_2 = -1 \times -9$$

$$m_2 = +9$$

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

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

$$y - 9x + \frac{80}{3}$$

Multiply through by 3

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

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

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

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

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

for Normal

$$m_1 = -1/10, m_2 = -1/10$$

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

$$y - 8 = -1/10x + 1/5$$

$$y + 1x - 8 - 1 = 0$$
$$\frac{y}{10} \quad \frac{1}{5}$$

$$y + 1x - 4 = 0$$
$$\frac{y}{10} \quad \frac{1}{5}$$

i) Multiply through by 10

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

3.) $y = x^3/2$ At point $(-1, -1/2)$

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

$$\frac{dy}{dx} = \frac{2 \cdot 3x^2 - x^3 \cdot 0}{(2)^2} = 4$$

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

$$m = \frac{6(-1)^2}{2} = 3 //$$

for tangent

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

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

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

$$y - 3/2x + 1/2 - 3/2 = 0$$

$$y - 3/2x - 1 = 0 ; 2y - 3x - 2 = 0 //$$

4. $y = 1 + x - x^2$ pt points $(-2, -5)$

$$\frac{dy}{dx} = 0 + 1 - 2x$$

$$\frac{dy}{dx} = 1 - 2x \quad \left| \quad m = 1 - 2(-2) \right.$$

$$m = 1 + 4$$

$$m = 5,$$

for Tangent

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

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

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

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

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

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

for Normal

$$m = -1/5$$

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

$$y + 5 = -1/5x + -2/5$$

$$y + 1/5x + 5 + 2/5$$

$$y + 1/5x + 27/5 = 0$$

Multiply through by 5

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

5.) $y = 1/x$

$$\frac{dy}{dx} = \frac{x \cdot 0 - 1 \cdot 1}{x^2}$$

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

$$m = -1/9$$

for Tangent

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

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

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