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Math 104 Assignment

1) $2x$ at the point $(1, 2)$ | $m = 12 - 2 = 10$

$$= 4x$$

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

$$= 4(1) = 4$$

equation of the tangent:-

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

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

$$-2 = 4x - 4$$

$$= 4x - 4 + 2$$

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

equation of the normal:-

$$m_2 = \frac{1}{m_1}$$

$$= -\frac{1}{4}$$

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

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

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

$$-8 = -x + 1$$

$$-x - 8 - 1 = 0$$

$$-x - 9 = 0$$

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

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

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

a) Equation of the tangent:-

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

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

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

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

$$y = 10x - 12$$

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

b) Equation of the normal

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

$$m_2 = -\frac{1}{10}$$

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

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

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

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

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

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

$$y = x^{3/2}$$

$$\frac{dy}{dx} = \frac{3x^{1/2}}{2}$$

$$m = \frac{dy}{dx} \quad x = x_1$$

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

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

a) Equation of the tangent

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

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

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

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

$$2y - 3x - 2 = 0$$

b) Equation of the normal

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

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

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

$$6y + 3 = -4(x + 1)$$

$$6y + 3 = -4x - 4$$

$$6y + 4x + 7 = 0$$

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

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

$$m = \frac{dy}{dx} \quad x = x_1$$

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

$$m = 1 + 2 = 3$$

a) Equation of the tangent

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

$$y - (-5) = 3(x + 2)$$

$$y + 5 = 3x + 6$$

$$y - 3x - 1 = 0$$

b) Equation of the normal

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

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

$$y + 5 = -\frac{1}{3}(x + 2)$$

$$3y + 15 = -1(x + 2)$$

$$3y + 15 = -x - 2$$

$$3y + x + 17 = 0$$

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

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

$$m = \frac{dy}{dx} \quad x = x_1$$

$$m = -\frac{1}{9}$$

a) Equation of the tangent:

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

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

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

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

b) Equation of the normal

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

$$m_2 = 9$$

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

$$3y - 1 = 27(x - 3)$$

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

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