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MAT 104 Assignment

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

a. for equation at tangent

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

$$m_1 = \frac{dy}{dx} \Big| x = x_1$$

$m_1 = 4(1) = 4$

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

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

$y - 2 = 4x - 4$

$\therefore y - 4x + 2 = 0$ is the equation at tangent

b. for equation at normal

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

$$y - y_1 = \frac{-1}{m_1}(x - x_1)$$

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

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

$4y - 8 = -x + 1$

$\therefore 4y + x - 9 = 0$ is the equation at normal

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

a. for the equation at tangent

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

$$m_1 = \frac{dy}{dx} \Big| x = x_1$$

$m_1 = 6(2) - 2$

$m_1 = 10$

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

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

$y - 8 = 10x - 20$

$\therefore y - 10x + 12 = 0$ is the equation at tangent

b. for the equation at normal

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

$$y - y_1 = \frac{-1}{m_1}(x - x_1)$$

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

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

$10y - 80 = -x + 2$

$\therefore 10y + x - 82 = 0$ is the equation at normal

3. $y = x^3/2$ at Point $(-1, -1/2)$

a. for the equation at tangent

$$\frac{dy}{dx} = \frac{V\frac{du}{dx} - U\frac{dv}{dx}}{V^2}$$

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

$$\frac{dy}{dx} = \frac{6x^2 - 0}{4}$$

$m = 6/4 = 2/3$

$\therefore$ equation of the tangent is $2y - 3x = 0$

b. for the equation at normal

$y - y_1 = -1/m_1 (x - x_1)$

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

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

$y + 2/3x + 7/6 = 0$

Dividing through by 6

$6y + 4x + 7 = 0$ is the equation of the normal

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

a. for the equation at tangent

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

$$m_1 = \frac{dy}{dx}\Big|_{x = x_1}$$

$m_1 = -2(-2) + 1 = 5$

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

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

$y + 5 = 5x + 10$

$y - 5x - 5 = 0$ is the equation at the tangent

b. for the equation at the normal

$$m_2 = -1/m_1 = \frac{-1}{5}$$

$y - y_1 = m_2(x - x_1)$

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

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

$5y + 25 = -x - 2$

$\therefore 5y + x + 27 = 0$ is the equation at normal

5. $y = 1/x$ at the Point $(3, 1/3)$

a. for the equation at tangent

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

$m_1 = (-3)^{-2} = -1/9$

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

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

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

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

$9y + x - 6 = 0$ is the equation of the tangent

b. for the equation at normal

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

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

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

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

$3y - 1 = 27x - 81$

$3y - 27x + 80 = 0$ is the equation of the normal