5. $y = \frac{1}{x}$ at points $(3, 1/3)$

$y = x^{-1}$

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

$m = -3^{-2} = -1/3^2$

$m = -1/9$

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

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

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

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

$27y + 3x = 18$

For the normal equation.

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

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

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

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

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

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

$3y - 1 = 27x - 81$

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

$3y - 27x = -80$

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

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

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

$$m = 1 + 4 \quad m = 5$$

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

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

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

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

$$y - 5x = 10 - 5$$

$$y - 5x = 5$$

for normal equation

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

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

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

Cross multiply

$$5y+25 = -1(x+2)$$

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

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

$$5y+x = -27$$

$m = \frac{dy}{dx} \Big| x = 2$

$m = 6x - 2, \quad m = 6(2) - 2, \quad m = 10$

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

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

$y - 8 = 10x - 20$

$y - 10x = -20 + 8$

$y - 10x = -12$.

For a normal equation.

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

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

Cross multiply

$10y - 80 = -x + 2$

$10y + x = 2 + 80$

$10y + x = 82$.

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

$\frac{dy}{dx} = \frac{3x^2}{0} = \text{Indefinite}$.

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19/MHS01/329
MAT 104 (Equation of tangent and normal)

For the curves in problem 1-5 at the points given, find (a) the equation of the tangent and (b) the equation of the normal.

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

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

$$m = \frac{dy}{dx} \Big| x = 1$$

$m = 4x$, $m = 4(1)$ $m = 4$.

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

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

$y - 2 = 4x - 4$

$y - 4x = -4 + 2$

$y - 4x = -2$

For normal y+2 equation.

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

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

Cross multiply

$4y - 8 = -x + 1$

$4y + x = +1 + 8$

$4y + x = 9$

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

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