# Calculus Worksheet #2 Unit 2 Selected Solutions

**Write the equation of any line that contains the given point and is tangent to the given function. Give the point of tangency with each equation.**

**3. ( 1, -2 ) ; $f(x) = x^2 - 2x + 3$**

**Let T(x, y) represent any point of tangency.**

**At point T, $y = f(x) = x^2 - 2x + 3$**

**Also, $\frac{y - y_1}{x - x_1} = f'(x)$**

$$f'(x) = 2x - 2$$

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

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

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

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

**Therefore, $2x^2 - 4x = x^2 - 2x + 3$**

$$x^2 - 2x - 3 = 0$$

$$(x - 3)(x + 1) = 0$$

$$x = 3 \text{ or } x = -1$$

$y = f(3) = 6$ point $(3, 6)$ $m_t = f'(3) = 4$

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

$$y - 6 = 4x - 12$$

$$\boxed{y = 4x - 6 \text{ at } (3, 6)}$$

$y = f(-1) = 6$ point $(-1, 6)$ $m_t = f'(-1) = -4$

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

$$y - 6 = -4x - 4$$

$$\boxed{y = -4x + 2 \text{ at } (-1, 6)}$$

**5. ( 2 , -5 ) ; $f(x) = x^3 - 6x^2 + 4x + 1$**

**Let T(x, y) represent any point of tangency.**

**At point T, $y = f(x) = x^3 - 6x^2 + 4x + 1$**

**Also, $\frac{y - y_1}{x - x_1} = f'(x)$**

$$f'(x) = 3x^2 - 12x + 4$$

$$\frac{y + 5}{x - 2} = 3x^2 - 12x + 4$$

$$y + 5 = (x - 2)(3x^2 - 12x + 4)$$

$$y + 5 = 3x^3 - 18x^2 + 28x - 8$$

$$y = 3x^3 - 18x^2 + 28x - 13$$

**Therefore,**

$$3x^3 - 18x^2 + 28x - 13 = x^3 - 6x^2 + 4x + 1$$

$$2x^3 - 12x^2 + 24x - 14 = 0$$

$$x^3 - 6x^2 + 12x - 7 = 0$$

$$(x - 1)(x^2 - 5x + 7) = 0$$

$$x = 1 \text{ or } x = \frac{5 \pm \sqrt{25 - 28}}{2}$$

$y = f(1) = 0$ point $(1, 0)$ $m_t = f'(1) = -5$

$$y - 0 = -5(x - 1)$$

$$\boxed{y = -5x + 5 \text{ at } (1, 0)}$$