

Assignment – Module 1

1. Determine the extreme values and examine the convexity/concavity for the following functions

$$f(x) = 3x^2 + 18x + 6$$

$$f(x) = e^{-x} \quad x > 0$$

$$f(x) = \sqrt{x} \quad x > 0$$

$$f(x) = 12x^5 - 30x^4 - 100x^3 + 180x + 200$$

2. Examine the function for convexity/concavity and determine the extreme values of the function

$$f(x) = x_1^2 + 10x_2^2 - 2x_1 - 40x_2 + 60$$

$$f(x) = x_1x_2$$

$$f(x) = 3x_1 - 4x_2 + 6$$

$$f(x) = -x_1^2 - x_2^2 + 2x_1 + 4x_2 - 10$$

3. Check for the optimal values of the function

$$f(x) = -x_1^2 - x_2^2 + x_1x_2 + 7x_1 + 4x_2$$

$$s.t. \quad 2x_1 + 3x_2 = 24$$

4. Maximize the function

$$f(x) = -x_1^2 - x_2^2$$

$$s.t. \quad x_1 + x_2 = 4$$

$$2x_1 + x_2 = 5$$

5. Minimize the function using K-T conditions

$$f(x) = x_1^2 + x_2^2$$

$$\text{s.t. } x_1 + 2x_2 = 4$$

$$2x_1 + x_2 = 5$$

$$f(x) = x_1^2 + x_2^2 - 2x_1 - 2x_2$$

$$\text{s.t. } x_1 + 2x_2 \leq 3$$

$$8x_1 + 5x_2 \geq 10$$

6. Optimize the function

$$f(x) = -x_1^2 - x_2^2 + 4x_1 + 6x_2$$

$$\text{s.t. } x_1 + x_2 \leq 2$$

$$-2x_1 - 3x_2 + 12 \geq 0$$

$$f(x) = -2x^2 + 5xy - 4y^2 + 18x$$

$$\text{s.t. } x + y \leq 7$$