

Assignment 0

Exercise 1. For the function $g(x) = -3x^2 + 24x - 30$, find the value for x that maximizes $g(x)$.

Answer.

$$g'(x) = -6x + 24$$

$$g'(4) = 0$$

$$g(4) = -3(4)^2 + 24(4) - 30$$

$$g(4) = 18$$

Exercise 2. Consider the following function:

$$f(x) = 3x_0^2 - 2x_0x_1^2 + 4x_1 - 8$$

what are the partial derivatives of $f(x)$ with respect to x_0 and x_1

Answer.

$$\frac{df}{dx_0} = 6x_0 - 2x_1^2$$

$$\frac{df}{dx_1} = -4x_0x_1 + 4$$

Exercise 3. Consider the matrix $A = \begin{bmatrix} 1 & 4 & -3 \\ 2 & -1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 0 & 5 \\ 0 & -1 & 4 \end{bmatrix}$, then answer the following and verify your answers in Python.

Answer. No, according to the mathematical rule of matrices multiplication the given two matrices have dimensions 2×3 and 2×3 which do not meet the dimensions that can be multiplied.

Exercise 3b. Multiply $A^T \times B$ and give its rank.

Answer.

$$\begin{bmatrix} -2 & -2 & 13 \\ -8 & 1 & 16 \\ 6 & -3 & -3 \end{bmatrix}$$

Rank = 2.

Exercise 3b. Suppose that random variable $X \sim N(2, 3)$ i.e. What is the mean?

Answer. Mean = 2
