<u>Assignment 0</u>

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.

$$\frac{df}{dx_0} = 9x_0^2 - 2x_1^2$$

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

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* $X \sim N(2, 3)$.

Answer.