1. Consider the following unconstrained optimization problem:

$$\max \; -3x_1 + x_1x_2 + x_2 - 2x_1^2 - x_2^2$$

a) Starting from the initial trial solution $(x_1, x_2) = (0, 0)$, do **one** iteration of the gradient search procedure.

b) Set the gradient to zero to obtain a system of linear equations, then solve the system to get the exact solution.

2. Solve the NLP problem by using the KKT conditions.

$$\max \; 2x_1 + 3x_2 - x_1^2 - x_2^2$$
s.t. $x_1 + x_2 \leq 2$

            $x_1, x_2 \geq 0$