

Consider the following optimization problem:

$$\max_{x,y} \{100 - x^2 - y^2\} \quad s.t. \quad e^{x+y} = 1$$

1. What are the first order conditions (FOCs) for this problem?
2. Find the stationary point that satisfies these FOCs (i.e. find x^* and y^*).
3. Find the bordered Hessian for this problem.
4. Are the second order conditions for a maximum satisfied? Show your work.
5. What is the value of the Lagrange multiplier for this problem? Explain what this (specific numerical) value means for the problem.

Consider the following optimization problem:

$$\max_{x,y} \{\ln x + \ln y\} \quad s.t. \quad 100 = x + 2y$$

1. What are the first order conditions (FOCs) for this problem?
2. Find the stationary point that satisfies these FOCs (i.e. find x^* and y^*).

5 Optimization with Inequality Constraints

Consider the following optimization problem:

$$\max_x \{1 + 3x^2 - x^3\} \quad s.t. \quad x \geq 2$$

1. Write down the Kuhn-Tucker conditions.
2. Find the solution. Remember, you must check all cases and show your work

6 Optimization with Inequality Constraints

Consider the following optimization problem:

$$\min_{x,y} \{x^2 + y^2\} \quad s.t. \quad 4x + 2y \geq 10$$

1. Write down the Kuhn-Tucker conditions. Be very careful here. This is a minimization problem so things will look a bit different. Refer to the notes that I sent out.
2. Find the solution. Remember, you must check all cases and show your work.

