**Exercise 09 (Assignment 4)**

- **Due date: Thursday, Dec 12**

1. For Question 2 of Exercise 08:

$$\max\,(\min)\,\{x_2x_3 + x_1x_3\} \quad \text{subject to } x_2^2 + x_3^2 = 1 \text{ and } x_1x_3 = 3$$

   Do you think the solutions are global maximum or global minimum? why?

2. Solve the following problem

$$\min\left\{x^2 + y^2 + 2x - 2y\right\} \quad \text{subject to } x^2 + y^2 \leq 4$$

   (a) Find all solutions satisfying the first order conditions/Kuhn Tucker conditions

   (b) Find the global minimum by checking the sufficient conditions

3. Solve the problem

$$\max_{x,y\geq 0}\{xy\} \quad \text{subject to } \begin{cases} x + y \leq 100 \\ x \leq 40 \end{cases}$$

   (a) Find all solutions satisfying the first order conditions/Kuhn Tucker conditions

   (b) Find the global maximum by checking the sufficient conditions

4. Solve the following problem:

$$\max_{x_1,x_2}\left\{x_1^2x_2\right\} \text{ subject to } 2x_1^2 + x_2^2 = 3$$

   (a) Find all solutions satisfying the first order conditions

   (b) check whether each of your solution is a local minimum or local maximum

   (c) Find the global maximum by checking sufficient conditions

   (d) Find the maximized value of $x_1^2x_2$ of the constrained problem

   (e) Use Envelop Theorem to estimate the maximized value of the following problem:

$$\max_{x_1,x_2}\left\{x_1^2x_2\right\} \text{ subject to } 2x_1^2 + x_2^2 = 2.9$$