13.03.2025

IE 203 PS 4

1- Formulate a single facility location problem over continuous space using L^2-norm.

2- a) Formulate a facility location problem over continuous space using L^1-norm.
b) Linearize the formulation in part a.

3- We want to see how well a curve in the form of $y = a(x)^b$ fits the following data where a and b are constants.

x_i	2	6	20	25	40
y_i	8.4	5.5	4.2	3.7	3.1

Formulate an unconstrained NLP to fit this form to minimize the sum of squared errors.

4- Repeat Question 3 for fitting a line, minimizing sum of squared errors.

5- Linearize the expression xy where x and y are binary variables.

6- Linearize the expression xy where x is a continuous variable in range (L, U) and y is a binary variable.

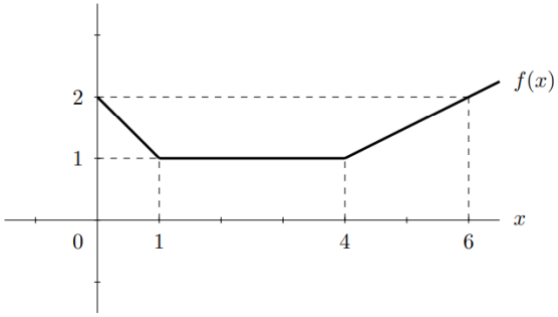
7- A closed cylindrical tank is being designed to carry at least $20\ m^3$ of chemical. Metal for the top and sides cost \$2 per square meter, but heavier metal of the base costs \$8 per square meter. Also, the height of the tank cannot be more than twice the diameter to keep it from being top heavy. Formulate an NLP to find a design of minimum cost.

8- Convert the problem,

$$\begin{aligned} &\min f(x) \\ &st.\ ax \geq b \\ &x \geq 0 \end{aligned}$$

into a linear program, where a, b are constants and $f(x)$ is the function plotted below.

a)



b)