

HW 12

1.

Consider the problem

$$\begin{aligned} &\text{minimize} && f(x) = e^x \\ &\text{subject to} && x \geq 1. \end{aligned}$$

What is the solution to this problem? Formulate and solve the dual problem. Formulate the dual to the dual problem and show that it is equivalent to the primal problem.

2. Consider the problem

$$\begin{aligned} &\text{minimize} && f(x) = -3x \\ &\text{subject to} && 1 - x^3 \geq 0. \end{aligned}$$

Formulate and solve the dual to the problem using each of the following sets.

- (i) $X = \{x : 0.5 \leq x \leq 1.5\}$;
- (ii) $X = \{x : 0 < x\}$;
- (iii) $X = \{x : -1 \leq x\}$.

3. Extra credit. Using duality solve the following problem

$$\begin{aligned} &\text{minimize} && f(x) = \sum_{i=1}^n |x_i - a_i| \\ &\text{subject to} && \sum_{i=1}^n x_i = 0. \end{aligned}$$