

Linear & Nonlinear Programming

Homework Set 6

DUE: 6:00 pm, Nov 7, 2018

1. For fixed matrix A and right-hand-side vector \mathbf{b} , the optimal value is a function of objective coefficient vector \mathbf{c} :

$$\begin{aligned} f_c(\mathbf{c}) = \min \quad & \mathbf{c}^T x \\ \text{subject to} \quad & A\mathbf{x} = \mathbf{b}, \\ & x \geq 0 \end{aligned} \tag{1}$$

Theorem: $f_c(\mathbf{c})$ is a concave function in \mathbf{c} .

2. For fixed matrix A and right-hand-side vector \mathbf{b} , the optimal value is a function of objective coefficient vector \mathbf{c} :

$$\begin{aligned} f_b(\mathbf{b}) = \min \quad & \mathbf{c}^T x \\ \text{subject to} \quad & A\mathbf{x} = \mathbf{b}, \\ & x \geq 0 \end{aligned} \tag{2}$$

Theorem: $f_b(\mathbf{b})$ is a convex function in \mathbf{b} , that is for any $0 \leq \alpha \leq 1$.

$$f_b(\alpha \mathbf{b}_1 + (1 - \alpha) \mathbf{b}_2) \leq \alpha f_b(\mathbf{b}_1) + (1 - \alpha) f_b(\mathbf{b}_2)$$

3. P192, Exercise 4.20 (Optional, DUE: Nov 14, 2018).

Reading Assignment:

- Please review slides: lecture 03 (Theory of Polyhedron and Duality), lecture 04 (Application of duality).
- Preview Sides (Introduction to mixed integer programming) in Wechat group.
- Install gurobi, and master basic operation of gurobi using demo code in Wechat.