

620-261 Introduction to Operations Research

TUTORIAL 5

1. Rewrite the following linear programming problems in canonical form:

(a)

$$\begin{aligned} \min \quad & z = 4x_1 + 4x_2 + x_3 \\ \text{subj to} \quad & x_1 + x_2 + x_3 \leq 2 \\ & 2x_1 + x_2 \leq 3 \\ & 2x_1 + x_2 + 3x_3 \geq 3 \\ & x_1 \geq 0, x_2 \geq 0, x_3 \geq 0. \end{aligned}$$

(b)

$$\begin{aligned} \min \quad & z = 4x_1 + 4x_2 + x_3 \\ \text{subj to} \quad & x_1 + x_2 + x_3 = 2 \\ & 2x_1 + x_2 \leq 3 \\ & 2x_1 + x_2 + 3x_3 \geq 3 \\ & x_1 \geq 0, x_2 \geq 0, x_3 \geq 0. \end{aligned}$$

(c)

$$\begin{aligned} \min \quad & z = 4x_1 + 2x_2 + 3x_3 \\ \text{subj to} \quad & x_1 + x_2 + x_3 = 11 \\ & 2x_1 + 3x_2 + x_3 \leq -20 \\ & x_1 + 3x_2 + 2x_3 \geq 10 \\ & x_1 \text{ unrestricted, } x_2 \geq 0, x_3 \geq 0. \end{aligned}$$

2. Solve 1(a) and 1(b) using the two-phase method.

3. Write down the elementary matrices E_1, E_2, \dots, E_n that correspond to the row operations that you used in the solution of 1 (a). Let $S|b$ be the initial tableau and $S'|b'$ be the final tableau. Verify that $S' = TS$ and $b' = T|b$ where $T = E_n \dots E_1$.