MATH 318: Operations Research
Spring 2023

*Assignment 7*
*Due: Wednesday, April 17*

READ: Hillier & Lieberman: Chapter 6, Section 5 and Chapter 7, Sections 1- 2;
Hillier & Lieberman: Chapter 10, Sections 1 –2 .

PROBLEMS: Write up clear and complete solutions for the following problems from Hillier and Lieberman:

- 7.2 – 4 bcdf
- 6.5 – 2
- 7.2 – 11

Perhaps the easiest way to do Problem 7.2-11 is to let $c_2 = 5 + \Delta c_2$ (the problem data are on p. 236). Updating the final tableau will show that you have lost Gaussian form. The required elimination step will affect only the *Z*-row; the goal is that everything there stays nonnegative.

I Consider the following problem.

$$\text{Maximize} \quad Z = 3x_1 + x_2 + 2x_3$$

subject to

$$x_1 - x_2 + 2x_3 \le 20$$
$$2x_1 + x_2 - x_3 \le 10$$

$$\text{and } x_1 \ge 0, \quad x_2 \ge 0, \quad x_3 \ge 0.$$

Let $x_4$ and $x_5$ denote the slack variables for the respective functional constraints. After we apply the simplex method, the final simplex tableau is

| | Coefficient of: | | | | | | |
|---|---|---|---|---|---|---|---|
| Basic Variable | $Z$ | $x_1$ | $x_2$ | $x_3$ | $x_4$ | $x_5$ | Right Side |
| $Z$ | 1 | 8 | 0 | 0 | 3 | 4 | 100 |
| $x_3$ | 0 | 3 | 0 | 1 | 1 | 1 | 30 |
| $x_2$ | 0 | 5 | 1 | 0 | 1 | 2 | 40 |

(a) Perform sensitivity analysis to determine which of the 11 parameters of the model are sensitive parameters in the sense that *any* change in just that parameter's value will change the optimal solution.

(b) Use algebraic analysis to find the allowable range to stay optimal for each $c_j$.

(c) Use algebraic analysis to find the allowable range to stay feasible for each $b_i$.