

Assignment 4 – MAT 3210 (Linear Programming) on 3.1 and 3.2

No need to hand in

1. Use simplex method to solve the following LPP:

$$\text{maximize } z = -x_1 + 2x_2$$

subject to

$$x_1 + x_2 \leq 2,$$

$$x_1 - x_2 \leq 1,$$

$$x_1, x_2 \geq 0$$

2. Use Simplex Method to solve the following LPP

$$\text{maximize } z = 2x_1 - x_2$$

subject to

$$x_1 + x_2 \leq 2$$

$$x_2 \leq 1$$

$$x_1 - x_2 \leq 1$$

$$x_1, x_2 \geq 0$$

3. Solve the following LPP:

$$\text{maximize } z = 3x_1 - x_2 + 3x_3 + 4x_4$$

$$\text{subject to } x_1 + 2x_2 + 2x_3 + 4x_4 \leq 40$$

$$2x_1 - x_2 + x_3 + 2x_4 \leq 8$$

$$4x_1 - 2x_2 + x_3 - x_4 \leq 10$$

$$x_1, x_2, x_3, x_4 \geq 0$$

4. The following tableau represents a specific simplex iteration.

Basic	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	solution
x_8	0	3	0	-2	-3	-1	5	1	12
x_3	0	2	1	3	1	0	3	0	6
x_1	1	-1	0	0	6	-4	0	0	0
z	0	-5	0	4	-1	-10	0	0	620

- (a) Determine the leaving variable if the entering variable is (1) x_2 , (2) x_4 , (3) x_5 , (4) x_6 , (5) x_7 .
- (b) For each of the case in part (a), determine the resulting increase or decrease in z .

5. Solve the following LPP by simplex method

$$\text{minimize } x_2 - 3x_3 + 2x_5$$

subject to

$$x_1 + 3x_2 - x_3 + 2x_5 = 7$$

$$-2x_2 + 4x_3 + x_4 = 12$$

$$-4x_2 + 3x_3 + 8x_5 + x_6 = 10$$

$$x_1, x_2, x_3, x_4, x_5, x_6 \geq 0$$

Suppose that initially we use x_1, x_4, x_6 as basic variables.

6. Solve the following LPP in standard form

$$\text{maximize } 45x_1 + 80x_2$$

subject to

$$5x_1 + 20x_2 + x_3 = 400$$

$$5x_1 - 5x_2 + x_4 - x_3 = 50$$

$$x_1, x_2, x_3, x_4 \geq 0$$

(a) assume that x_3, x_4 are basic variables.

(b) how about using x_1, x_2 as basic variables?

7. (a) Transform the following LPP into standard form:

$$\text{minimize } z = -6x_1 + 8x_2$$

subject to

$$-3x_1 + 2x_2 + x_3 = 5$$

$$x_2 + 2x_3 \leq 4$$

$$x_2, x_3 \geq 0, x_1 \text{ is free}$$

(b) Assume that x_2, x_3 are initial basic variables. Use Simplex Method (for standard form) to find the optimal solution for the standard form in (a). **You can't eliminate x_1 .**