

OPERATIONS RESEARCH

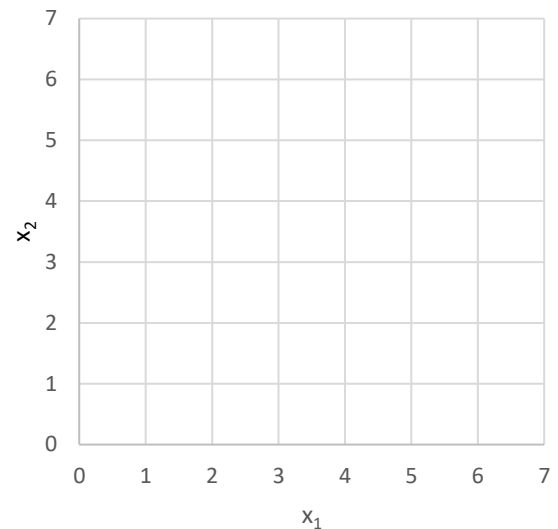
Lab 2 – The Simplex Method

Given are the following LP problems. Write them in the augmented form. Use the Simplex Method (tableau) to solve it. Mark the feasible region and BF solutions subsequently visited by the method. Answer the questions.

#1) $Max \quad Z = 2x_1 + 2x_2$
s. t. $x_1 \geq 0, x_2 \geq 0$

(1) $4x_1 + 2x_2 \leq 12$
(2) $2x_1 + 3x_2 \leq 8$
(3) $1x_1 + 3x_2 \leq 7$

Augmented form:



1	Base	Z	x_1	x_2	x_3	x_4	x_5	RS	MRT
(0)	Z								
(1)	x_3								
(2)	x_4								
(3)	x_5								

2	Base	Z	x_1	x_2	x_3	x_4	x_5	RS	MRT
(0)	Z								
(1)	x_1								
(2)	x_4								
(3)	x_5								

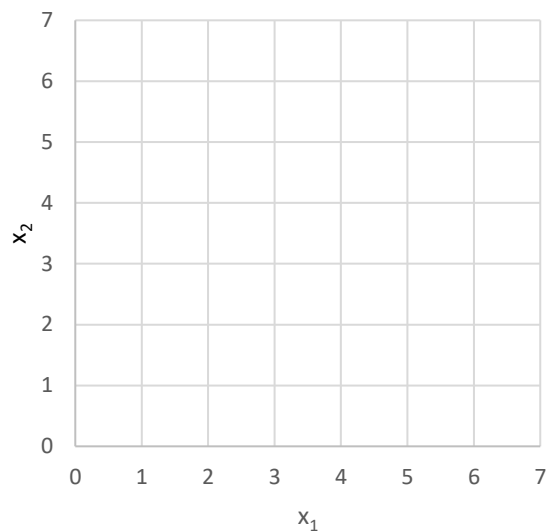
3	Base	Z	x_1	x_2	x_3	x_4	x_5	RS	MRT
(0)	Z								
(1)	x_1								
(2)	x_2								
(3)	x_5								

- Can you see some ties when determining leaving variables?
- Are there multiple optima? How can you find the answer in the tableau?

#2) $\text{Min } Z = 1x_1 + 2x_2$ s. t. $x_1 \geq 0, x_2 \geq 0$

(1) $2x_1 + 1x_2 \geq 4$
(2) $1x_1 + 3x_2 = 6$
(3) $4x_1 + 3x_2 \leq 15$

Augmented form:



1	BV	Z	x_1	x_2	x_3	\bar{x}_4	\bar{x}_5	x_6	RS	MRT
(0)	Z									
(1)	\bar{x}_4									
(2)	\bar{x}_5									
(3)	x_6									

2	BV	Z	x_1	x_2	x_3	\bar{x}_4	\bar{x}_5	x_6	RS	MRT
(0)	Z									
(1)	\bar{x}_4									
(2)	x_2									
(3)	x_6									

3	BV	Z	x_1	x_2	x_3	\bar{x}_4	\bar{x}_5	x_6	RS	MRT
(0)	Z									
(1)	x_1									
(2)	x_2									
(3)	x_6									

- a) What is the value of Z?
b) Extra: repeat this exercise but use the two-phase procedure.

#3) **PROGRAMMING ASSIGNMENT (deadline: 2 weeks):** Complete the Lab2_PuLP script.