

University of Toronto at Scarborough
Department of Computer and Mathematical Sciences

Linear Programming and Optimazation

MATB61 Winter 2020

Assignment # 1

You are expected to work on this assignment prior to your tutorial in the week of Jan. 13th, 2020. You may ask questions about this assignment in that tutorial. In your tutorial in the week of Jan. 20th, you will be asked to write a quiz based on this assignment and/or related material from the lectures in week 1, and textbook readings.

Textbook: Elementary Linear Programming With Applications
B. Kolman & R. Beck, 2nd edition

Read: Chapter 1 section 1, 1.1, 1.2 and Lecture note

Problems:

Section 1.1 #1 - #11.

In addition:

1. Set up LP problems:

The Two Mines Company own two different mines that produce an ore which, after being crushed, is graded into three classes: high, medium and low-grade. The company has contracted to provide a smelting plant with 12 tons of high-grade, 8 tons of medium-grade and 24 tons of low-grade ore per week. The two mines have different operating characteristics as detailed below.

Mine	Cost per day (£'000)	Production (tons/day)		
		High	Medium	Low
X	180	6	3	4
Y	160	1	1	6

How many days per week should each mine be operated to fulfill the smelting plant contract?

2. Convert the following LP problem into standard form:

a) Maximize $z = 4x_1 + 2x_2 + x_3$
Subject to $-x_1 + 3x_2 - x_3 \geq 1$
 $5x_1 + 3x_3 = 5$
 $x_1 + x_2 + x_3 \leq 1$
 $-1 \leq x_1, x_2 \leq 2, x_3 \geq 0.$

b) Maximize $x + 2y + 4z$
 Subject to $|4x + 3y - 7z| \leq x + y + z$
 $x, y, z \geq 0$.

3. Convert the following LP problem into canonical form:

a) Maximize $z = -x_1 - 2x_2 - x_3$
 Subject to $x_1 - x_2 + x_3 \geq 2$
 $|x_1 + x_2| \leq 3$
 $x_1, x_2 \geq 0$

b) Minimize $x - 12y + 3z$
 Subject to $5x - y - 2z = 10$
 $2x + y - 10z \geq -30$
 $y \leq 0, 1 \leq z \leq 4$

Note: There are answers at the back of the textbook for the odd number questions.