

University of Toronto at Scarborough
Department of Computer and Mathematical Sciences

Linear Programming and Optimazation

MATB61 Winter 2019

Assignment # 2

You are expected to work on this assignment prior to your tutorial in the week of January 21st, 2019. You may ask questions about this assignment in that tutorial. In your tutorial in the week of Feb. 4th, you will be asked to write a quiz based on the assignments 2&3 and/or related material from the lectures in weeks 2&3, and textbook readings.

Note: There is a quiz in the week of January 21st, 2019, based on the assignment 1 and/or related material from the lecture in week 1.

The following problems are not to be handed-in.

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

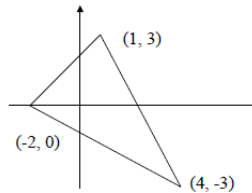
Read: Chapter 1 section 2, 3 and Lecture note

Problems:

1. Solve LP problems graphically in Section 1.1 #1, #2, #3, #5, #6
2. Section 1.2 #1 - #16
3. Section 1.3 #1 - #4, #17---24, #26 – 29, #32 - 37

In addition:

1. Find a 3×2 matrix A and a vector \mathbf{b} so that $A\mathbf{x} \leq \mathbf{b}$ describes this following region.



2. Consider the LP problem:

$$\begin{aligned} &\text{maximize } z = c^T x \quad \text{for } x \in R^s \\ &\text{subject to} \\ &\quad Ax \leq b \\ &\quad x \geq 0 \end{aligned}$$

Show that if there are two distinct points X_1 and X_2 where the objective function achieves the value 3 then there are infinitely points where the value 3 is achieved.

3. Given the LP problem:

Maximize $3x - 2y$

Subject to $5x + 2y - 3z + w \leq 7$

$3y - 4z \leq 6$

$x + z - w \geq 11$

$x, y, z, w \geq 0$.

Determine all feasible solutions to the linear programming problem for which

1) $x = y = w = 0$ 2) $y = 0, z = 6$ 3) $z = 0$

4. Explain why the following constraint set are not equivalent.

Set A

$x + y \leq 6$

$x + 2y \leq 10$

$x, y \geq 0$

Set B

$x + y + z = 6$

$x + 2y + z = 10$

$x, y, z \geq 0$

Note: You may check your graphic solutions on

<http://www.zweigmedia.com/RealWorld/LPGrapher/lpg.html>

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