MATB61 TUT3/4 Final Review
Solving a Linear Programming Problem

Nick Huang

April 10, 2021

This document is for the students in MATB61, TUT0003 and TUT0004 winter 2021 at the University of Toronto Scarborough. You should not use this document as your reference in the final exam. Everything covered in this document have been talked about in the lectures or in the textbook. The purpose of this document is for students to do more practices at various types of questions that they have seen in class. Also some questions are designed for students to detect the mistakes that the questions have by the definitions of the concepts. This document may not covered all materials that will appear in the final exam.

Recall that there are multiple ways to solve a given linear programming problem, in general, there are geometrical approach and algebraic approach. However it is not true that all the methods will always work for a given LPP.

Question

Solve the following LPP using the required method, if not possible, explain why.

$$\begin{aligned} \max\ & z = 3x + y \\ \text{subject to}\ & \\ & 2x + y \leq 4 \\ & x \leq 1 \\ & y \geq 1 \\ & x, y \geq 0 \end{aligned}$$

1. Solve the LPP using the graphical method.

2. Solve the LPP by finding the extreme points geometrically. Explain why this method will work.

$$\begin{aligned} \max\ & z = 3x + y \\ \text{subject to} & \\ & 2x + y \leq 4 \\ & x \leq 1 \\ & y \geq 1 \\ & x, y \geq 0 \end{aligned}$$

3. Solve the LPP by finding the extreme points algebraically. Explain why this method will work.

$$\begin{aligned} \max\ & z = 3x + y \\ \text{subject to} & \\ & 2x + y \leq 4 \\ & x \leq 1 \\ & y \geq 1 \\ & x, y \geq 0 \end{aligned}$$

4. Solve the LPP using the simplex algorithm. Identify the current BFS and current cost at each stage.

$$\begin{aligned} \max\ & z = 3x + y \\ \text{subject to} & \\ & 2x + y \leq 4 \\ & x \leq 1 \\ & y \geq 1 \\ & x, y \geq 0 \end{aligned}$$

5. Find the dual problem of the given LPP, and solve the dual problem. Conclude the optimal cost of the original LPP, if exists, with explanations.

$$\begin{aligned} \max\ & z = 3x + y \\ \text{subject to}\ & \\ & 2x + y \leq 4 \\ & x \leq 1 \\ & y \geq 1 \\ & x, y \geq 0 \end{aligned}$$