Introduction

Last week, we talked about the simplex method and how it can be used to solve a LPP with $b \geq 0$. This week, we will take a closer look at the simplex tableaux and think about what is happening behind geometrically when we are running the simplex algorithm.

Questions

1. Consider the following LPP:

   max $z = x_1 + x_2$

   subject to

   $x_1 + x_2 \leq 2$

   $x_1 + 3x_2 \leq 3$

   $x_1, x_2 \geq 0$

   Answer the following questions.

   (a) Draw the feasible region in the x_1x_2 plane and solve the LPP using the graphical method. Find all the optimal solutions and what is the optimal cost?

   (b) Looking at the graph of the feasible region, find all the extreme points using geometrical approach then solve the LPP using the extreme point theorem.

(c) Use the simplex method to solve the LPP. Clearly indicate the current BFSs, current cost, and identify the current BFSs in the graph of the feasible region, at every stage.

(d) Can you find a different optimal solution using the simplex tableaux that you end at question c?

2. Consider the following complex tableaux that happens at one intermediate step when solving a LPP using simplex algorithm.

x_1	x_2	x_3	x_4	x_5	x_6	
1	-1	1	1	0	0	1
0	1	2	0	1	0	3
0	1	1	1	0	1	2
0	0	-14	-3	0	0	-28

(a) What is the current BFS? What is the current cost? Is this an optimal solution?

(b) Can you find a worse BFS with a lower cost using the simplex tableaux above? Verify that the answer you got is actually a BFS.

(c) Can you find a worst BFS with the lowest cost using the simplex tableaux above?

(d) Can you find another optimal solution that is different from the current one, using the simplex tableaux above?