Algorithms Fall 2016 Homework 7 Solution

November 22, 2016

PROBLEM 1

We have:

$$-2x_1 - 2x_2 \leq -10$$

$$\Rightarrow x_1 + x_2 \geq 5$$

It contradicts to:

$$x_1 + x_2 \leq 2$$

So the linear program is infeasible.

PROBLEM 2

To use the SIMPLEX algorithm, we need to convert the program into slack form. The objective function in the linear program is minimization. We firstly convert it to maximization by negate the coefficients in the objective function, the new objective function is:

$$maximize \qquad -x_1 - x_2 - x_3$$

Then we need to convert the inequalities to less-than-or-equal-to constraints by multiplying them by -1, we get the following inequalities:

$$-2x_1 - 7.5x_2 - 3x_3 \leq -10000$$

$$-20x_1 - 5x_2 - 10x_3 \leq -30000$$

Now we get the standar form of the linear program which is as follows:

$$\begin{aligned} &maximize && -x_1 - x_2 - x_3 \\ &subject\,to && \\ & && -2x_1 - 7.5x_2 - 3x_3 \leq -10000 \\ & && -20x_1 - 5x_2 - 10x_3 \leq -30000 \\ & && x_1, x_2, x_3 \geq 0 \end{aligned}$$

Since the linear program contains negative constraints, it cannot be solved using SIMPLEX algorithm