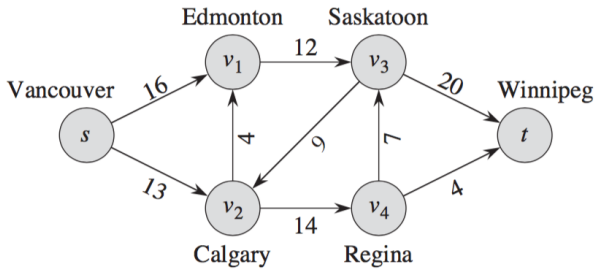
CS 581 Homework 8

Due on 03/08/2018

Problem 1.
Write a linear program formulation corresponding to finding the maximum flow in figure below. The objective function should be the maximum flow with regard to the source node.



Problem 2.
Use the simplex method to solve the following problem. For each pivot operation, select the non-basic variable with the largest coefficient in the objective function, and select the tightest constraint for that variable. Show your work.

maximize $z = 5x_1 + 4x_2 + 3x_3$, subject to

$$2x_1 + 3x_2 + x_3 \leq 5 \tag{1}$$

$$4x_1 + x_2 + 2x_3 \leq 11 \tag{2}$$

$$3x_1 + 4x_2 + 2x_3 \leq 8 \tag{3}$$

$$x_1, x_2, x_3 \geq 0 \tag{4}$$

Problem 3.
Use the simplex method to solve the following problem. For each pivot operation, select the non-basic variable with the largest coefficient in the objective function, and select the tightest constraint for that variable. Show your work.

minimize $z = 3x_1 + 4x_2$, subject to

$$2x_1 + x_2 \leq 600 \tag{5}$$

$$x_1 + x_2 \leq 225 \tag{6}$$

$$5x_1 + 4x_2 \leq 1000 \tag{7}$$

$$x_1 + 2x_2 \geq 150 \tag{8}$$

$$x_1, x_2 \geq 0 \tag{9}$$

Problem 4.
Use the FFT to compute $C(x)$ as the product of $A(x)$ and $B(x)$, where $A(x) = x^2 + 3x + 1$ and $B(x) = x + 7$.

a) Find the value of $A(x)$ at the complex fourth roots of unity (1, -1, i, $-i$).

b) Find the value of $B(x)$ at the complex fourth roots of unity.

c) Use the results of (a) and (b) to find the value of $C(x)$ at the complex fourth roots of unity.

d) Use these results to find the coefficients of $C(x)$.