ENGS 104 Fall 2015 Assignment 2

Due October 30, 2015

Instructor: George Cybenko

1. Download the file, a2p1.mat and do *load('a2p1.mat')* in Matlab to load variables, $a,\ b,\ c$ which form a linear program in augmented form

$$\min_x c' * x \ \text{ such that } \ a * x = b,\ x \geq 0.$$

   (a) Which feasible solution has the largest value for x_{23}?

   (b) Is there a basic feasible solution involving $x_4,\ x_{12},\ x_{23}$? Explain how you got your answer.

   (c) Solve the augmented linear program and print the solution.

2. For the same $a,\ b,\ c$ as above:

   (a) Solve

$$\min_y ||y * a - c||_\infty.$$

   (b) Solve

$$\min_u ||u * a - c||_1.$$

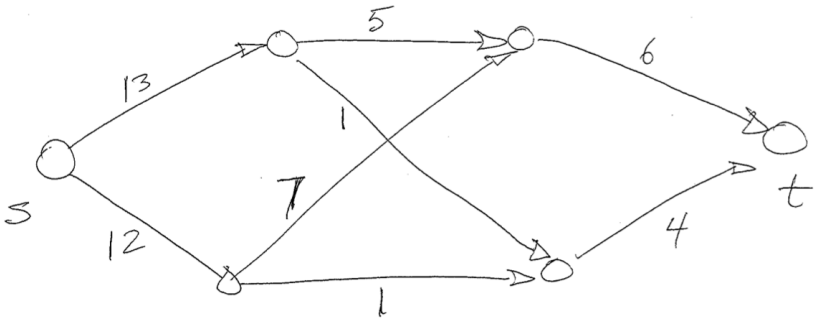
   (c) Solve

$$\min_z ||z * a - c||_2.$$

   (d) Solve

$$\min_w \ \left(||w * a - c||_1 + ||w * a - c||_\infty \ \right).$$

3. Express the max flow problem shown below as a linear program and solve.



4. Construct the associated dual problem to the above problem and solve it.

5. Consider the three sets:

$$A = \{(x_1, x_2, x_3) \mid x_1 + x_2 + x_3 = 30\}$$

$$B = \{(x_1, x_2, x_3) \mid x_1^2 + 2x_2^4 + 3x_3^2 = 2\}$$

$$C = \{(x_1, x_2, x_3) \mid 2(x_1 + 40)^2 + (x_2 - 30)^2 + (x_3 + 20)^4 = 1\}$$

   What points $a \in A,\ b \in B,\ c \in C$ minimize $||a - b||_2^2 + ||c - b||_2^2 + ||a - c||_2^2$?