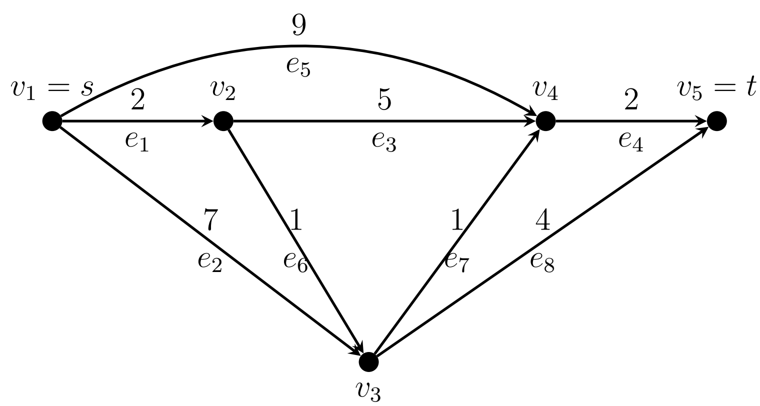
Math 482 **HW8** Section: ____________ Name: ______________________________________

Due Friday, November 4, 2016

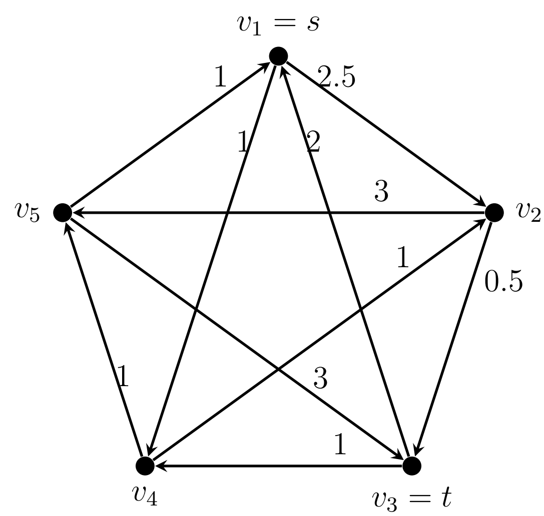
Students in section D13 and E13 (three credit hours) need to solve any four of the following five problems. Students in section D14 and E14 (four credit hours) must solve all five problems.

1. Interpreting the numbers on edges as edge lengths, solve the shortest (s,t)-path problem for the graph drawn below using the simplex method with Bland's pivot rules with the initial basis $\{e_1, e_2, e_3, e_4\}$.
   Hint: this is similar to example 3.7 in the book



2. State the dual to the shortest path problem above and use your solution to problem 1 and complementary slackness to give its solution.

3. Let G be the network with the flow drawn below with $s = v_1$ and $t = v_3$. Write the flow as a sum combination of positive flows along cycles and (s,t)-paths.



4. Suppose there are n men and n women and m marriage brokers (labeled $c_1, \ldots, c_m$). Each broker has a list of men and women as clients and can arrange marriages between any pairs of men and women on the list. In addition, we restrict the number of marriages that broker i can arrange to a maximum of b_i. Each man can be married to at most one women and each women can be married to at most one man. Translate the problem of finding a solution with the most marriages into one of finding the maximum flow in a flow network. (You can assume that if the capacities on the edges are all integers, than there exists a maximum flow in which the flow on every edge is an integer.)

5. Use the revised simplex method to find an optimal solution to the problem

$$\text{Minimize } z = x_1 + x_2 + x_3$$

subject to

$$\begin{cases} x_1 + x_4 - 2x_6 &= 5, \\ x_2 + 2x_4 - 3x_5 + x_6 &= 3, \\ x_3 + 2x_4 - 3x_5 + 6x_6 &= 5, \\ x_1, \ldots, x_6 &\geq 0. \end{cases}$$