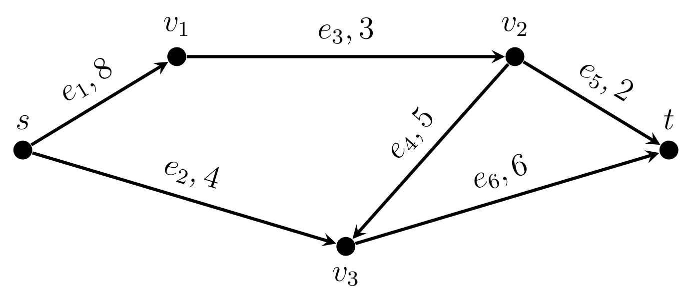
Math 482 **HW9** Section: ____________ Name: ______________________________________

Due Friday, November 18, 2016

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

1. Use the revised simplex method to find a maximal flow in the network below (the capacity on edge is listed above the edge). **Do not** write explicitly the whole arc/chain matrix. Use an auxiliary shortest path problems to find each pivot column. Furthermore, you must select the (s,t)-path $s \to v_1 \to v_2 \to v_3 \to t$ as the first shortest path.



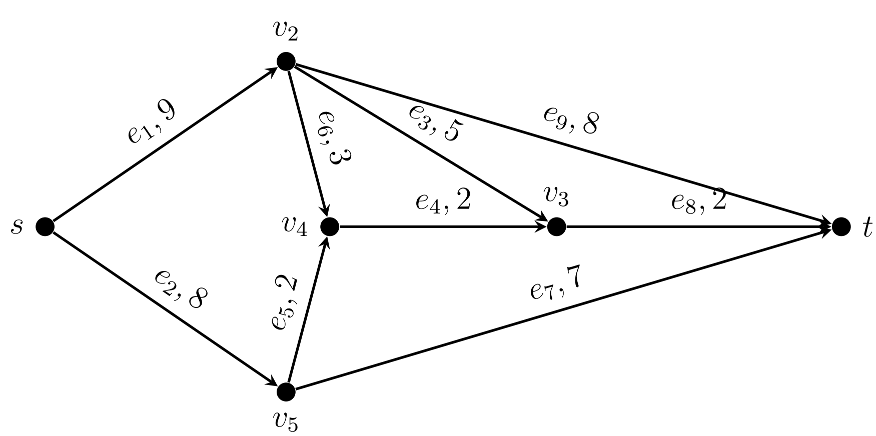
2. Starting from the dually feasible vector $\pi^T = (0,0)$, use the primal-dual simplex method to find an optimal solution to the problem

$$\text{Minimize } z = 2x_1 + 8x_2 + 0x_3 + 8x_4$$

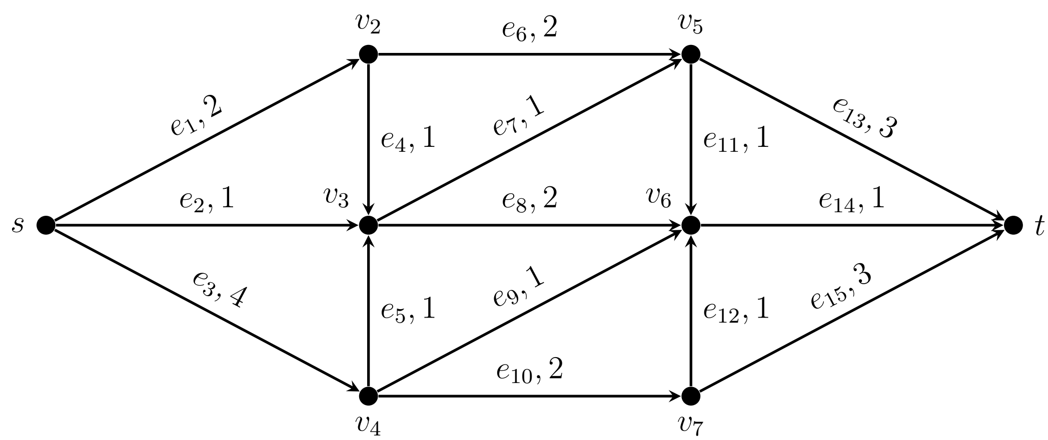
subject to

$$\begin{array}{rrrrcl} -x_1 & +x_2 & +2x_3 & +2x_4 & = & 12, \\ x_1 & -2x_2 & -x_3 & -3x_4 & = & 10, \\ x_1, & x_2, & x_3, & x_4 & \geq & 0. \end{array}$$

3. Beginning with the vector $\pi = (0,0,0,0,0,0)^T$ which is feasible for the dual, use the primal dual method as described in class and section 5.4 of the book to find a shortest path from s to t in the weighted graph shown below. For each iteration, you must write π, π^r and θ.



4. Apply the Ford-Fulkerson algorithm to the following network. On each iteration, write the current flow f (starting with $f = 0$), the augmenting path f^r and θ (you only need to write the non-zero elements of f^r).



5. Starting from the dually feasible vector $\pi^T = (1, 1)$, use the primal-dual simplex method to find an optimal solution to the problem or determine that it is infeasible.

$$\text{Minimize } z = 2x_1 + 4x_2 + 7x_3 + x_4$$

subject to

$$\begin{array}{rrrrcl} 4x_1 & +x_2 & -3x_3 & +3x_4 & = & 6, \\ -3x_1 & -x_2 & +x_3 & -2x_4 & = & 3, \\ x_1, & x_2, & x_3, & x_4 & \geq & 0. \end{array}$$