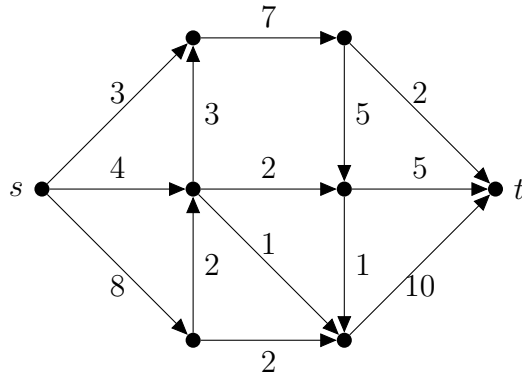## MATH-566   HW 8

Due **Oct 28** before class. Just bring it before the class and it will be collected there.
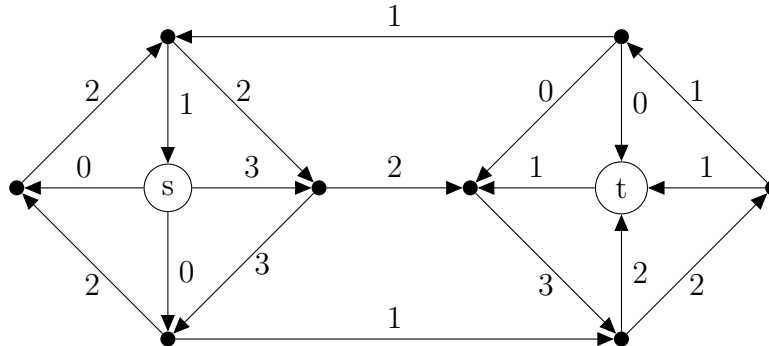
1: (*Combining cuts*)
Consider the graph below.

Find a shortest path and prove optimality using duality (dual LP can be used).

2: (*Decomposing a flow*)
Consider the network below with given edge values, forming an integer feasible flow. Demonstrate a list of path and cycle flows whose sum is this flow.

3: (*Augmenting paths*)
Consider the network below with given capacity and flow values. (The edge label f, u means flow-value f and capacity u.) Find augmenting paths and augment the flow is a maximum flow.
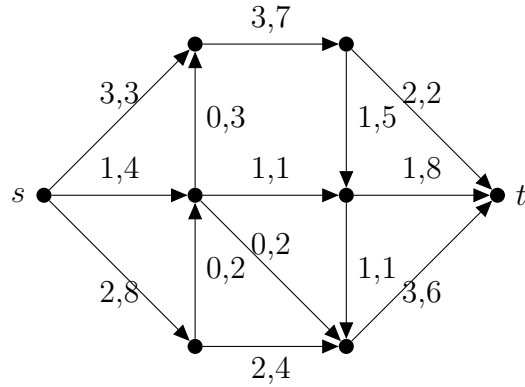
4: (*Combining cuts*)
Let (G, u, s, t) be a network, and let $\delta^+(X)$ and $\delta^+(Y)$ be minimum s-t-cuts in (G, u). Show that $\delta^+(X \cap Y)$ and $\delta + (X \cup Y)$ are also minimum s-t-cuts in (G, u).

5: (*Ford-Fulkerson algorithm may not finish*)
Show that in case of irrational capacities, the Ford-Fulkerson algorithmmay not terminate at all. Hint: See the book (in particular exercises).