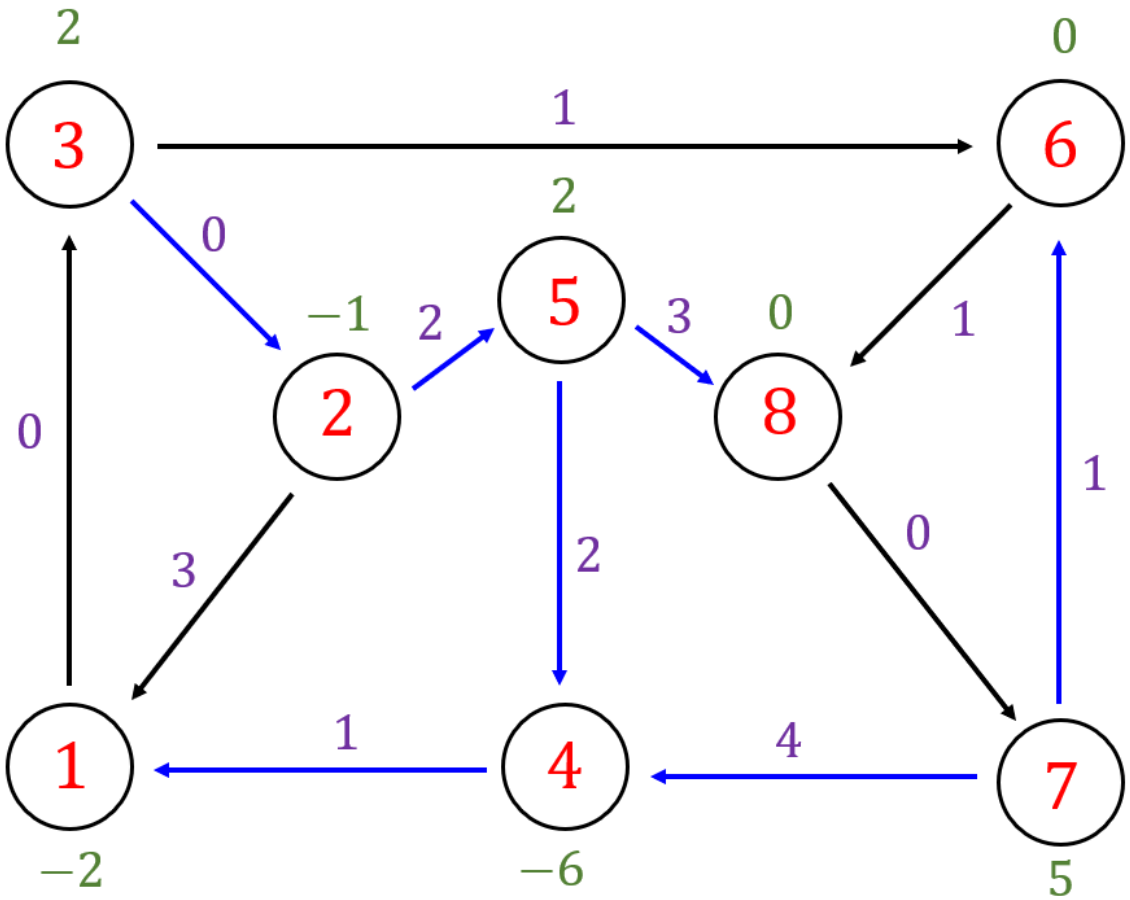
# APMA 1210 – HOMEWORK 6

**Reading:** Sections 7.3 and 7.5

**Problem 1:** (6 points) Use the network simplex algorithm to find the optimal tree and optimal cost of the following network. The numbers on the edges are the **COSTS** on each edge. Start with the tree in blue.

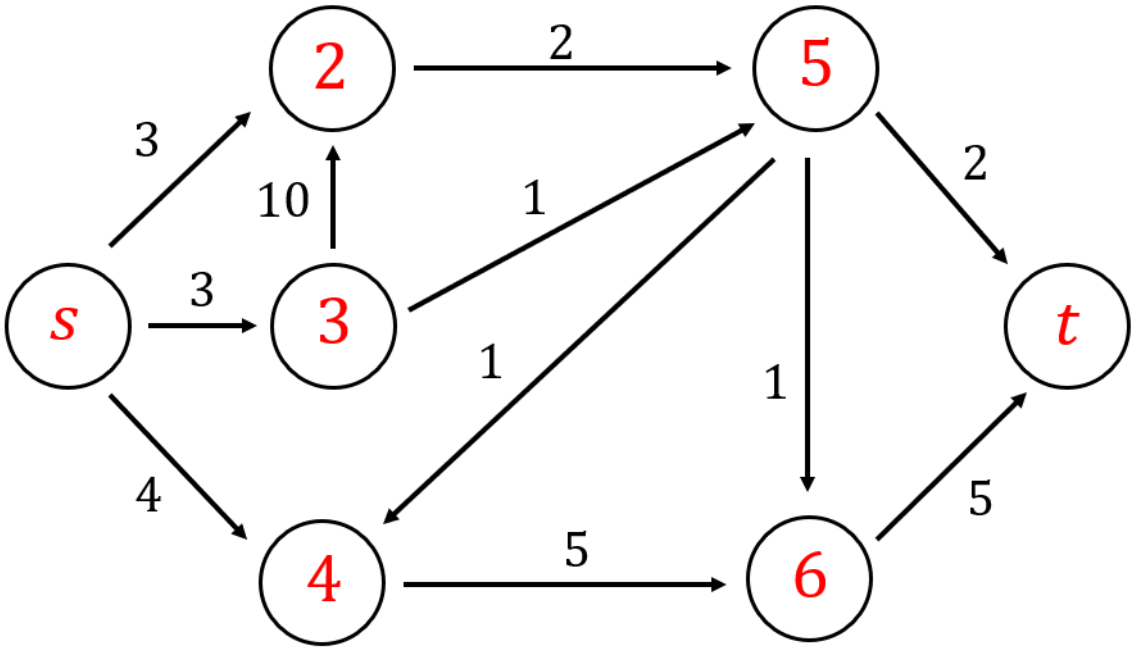



*Date*: Due: Thursday, November 10, 2022 at 11:59 pm.

**Problem 2:** (7 = 6 + 1 points)

(a) Solve the max-flow problem (optimal edges and optimal value) for the following network using the method of residual graphs

(b) On your original graph, draw a cut whose value is equal to the max-flow value you found.

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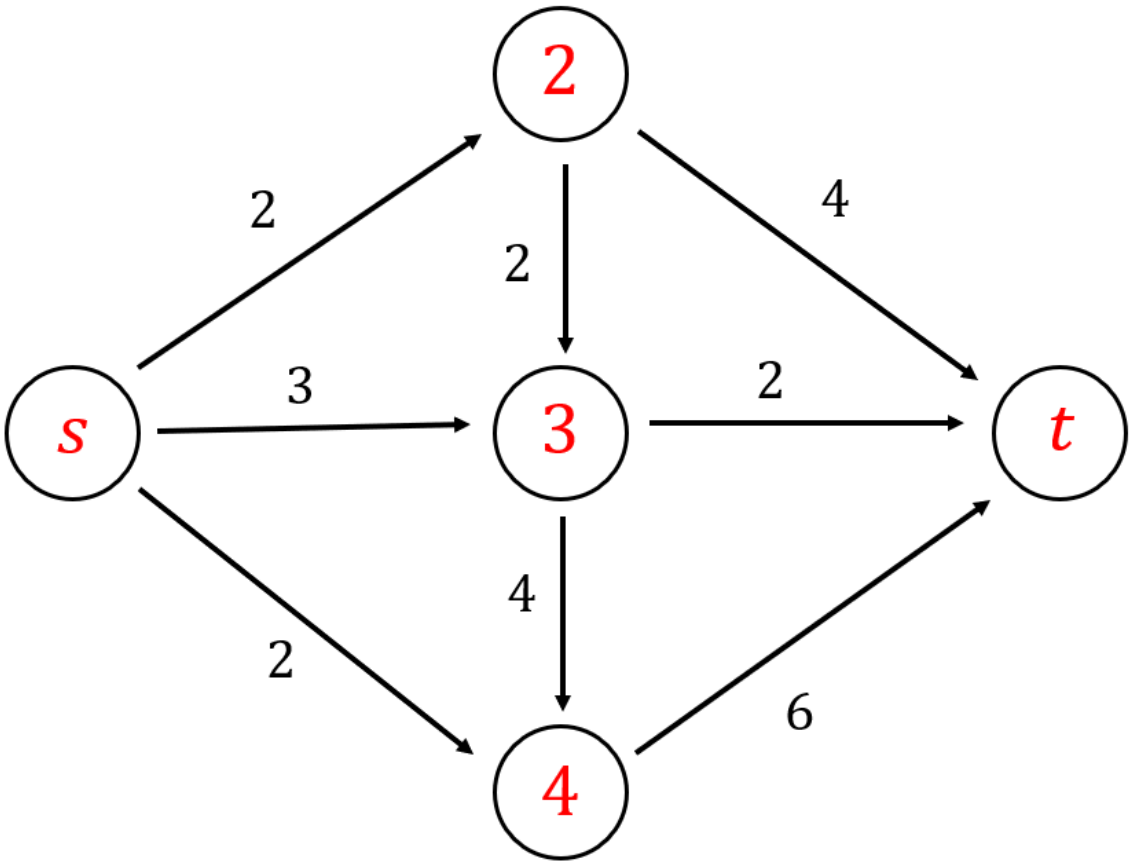
**Problem 3:** (4 points) Solve for the value of the max flow problem for the following network by using the min cut method




**Hint:** Try all 8 possible cuts. The cut can be a curve, it doesn't have to be a line; just make sure it separates $s$ and $t$

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**Problem 4:** (3 points) Show that a max-flow graph with $n$ intermediate vertices (= vertices other than $s$ and $t$) has $2^n$ cuts.

**Hint:** Notice that any set of vertices that includes $s$ but excludes $t$ determines a cut (you don't have to prove this) For example, in the problem above, try to draw the cut separating $s$, 2, 3 from the other vertices. So really you just want to ask yourself how many such sets there are.