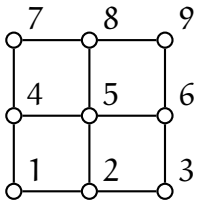
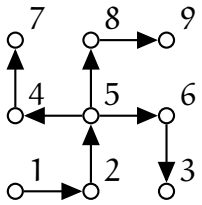
2022F Math589 Midterm 1

5 questions, $20(+5)$ **total points**
Note: Use other papers to answer the problems. Remember to write down your **name** and your **student ID #**.

1. [5pt] Let G be a graph and T a rooted tree with root 1 as shown below.



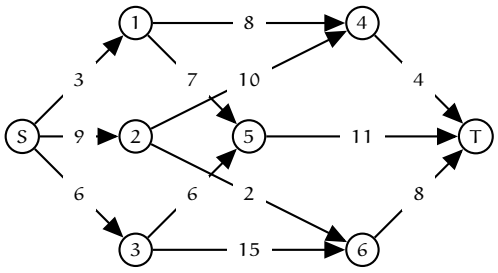
G



T

   Can T be the searching tree of some BFS process? Can T be the searching tree of some DFS process? Provide your reasons.

2. [5pt] Let Γ be the directed graph below, where s and t are the source and the sink, respectively. The number on each edge is its capacity.



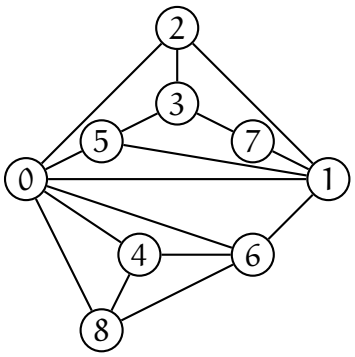
   Find a flow function f with the maximum value and a cut (A, B) with the minimum capacity.

3. [5pt] Find a graph G whose vertex connectivity is $\kappa(G) = 2$ and whose edge connectivity is $\lambda(G) = 4$.

Two more problems on the back.

4. [5pt] Find a graph with 2 cut-vertices and 6 blocks. List all the cut-vertices and all the blocks.

5. [extra 5pt] Let G be the graph below.



Find the maximum number of edge-disjoint paths between 0 and 1. Provide your reasons of why it is maximum.