CS 3343 Analysis of Algorithms – Fall 2011

11/10/11

10. Homework

Due **11/22/11** before class

1. **DFS edges (9 points)**

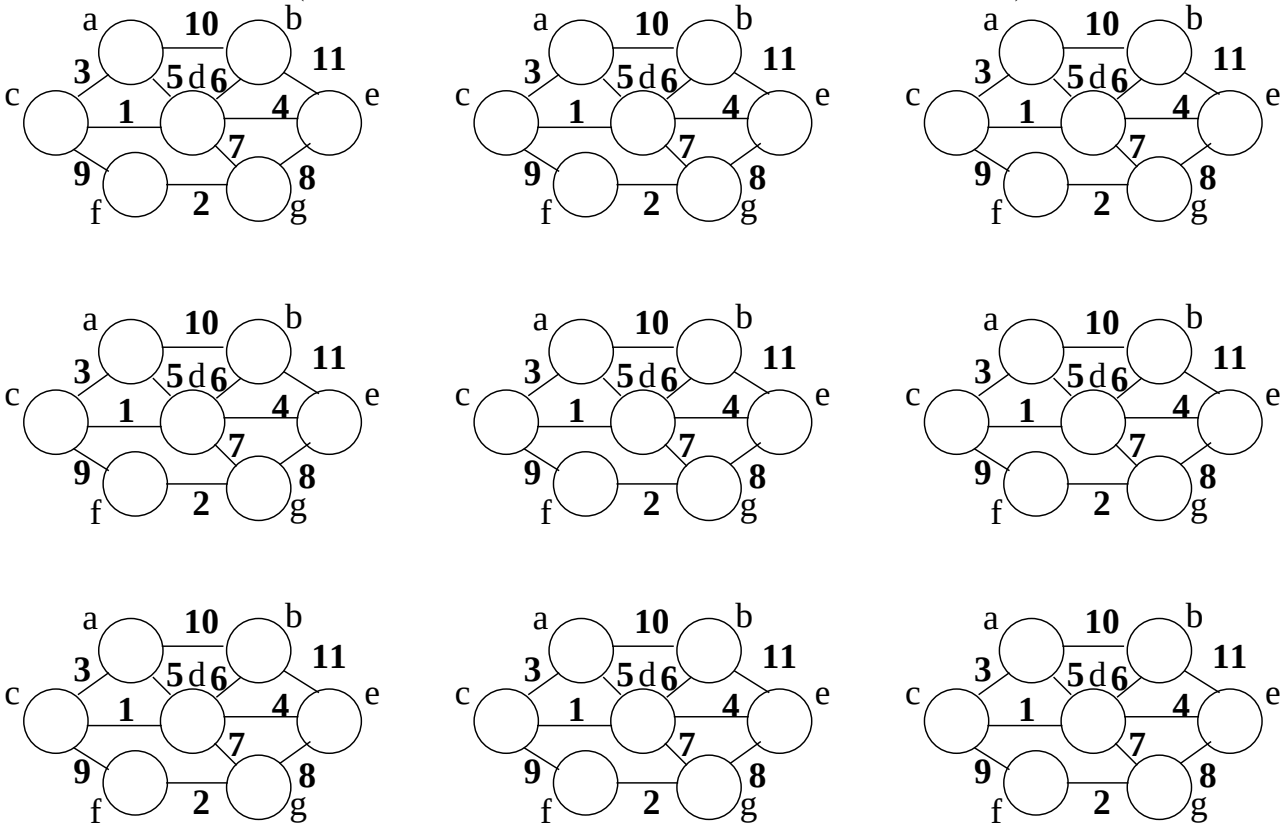
   Make a 3-by-3 chart with row and column labels "unvisited, visited, finished". (This corresponds to the colors white, gray, black in the book.) In each cell (i, j) indicate whether, at any point during a DFS of a **directed** graph, there can be an edge from a vertex with property i to a vertex with property j. For each possible edge, indicate what edge type it can be (there can be multiple per cell). *(Hint: Refer to slide 42 of the graph slides.)*

2. **DFS-tree and MST (4 points)**

   Give an example of a connected weighted (undirected) graph for which the DFS-tree is different from the MST computed by Prim's algorithm. Justify your answer. Is the DFS-tree in your graph a spanning tree?

3. **Kruskal (5 points)**

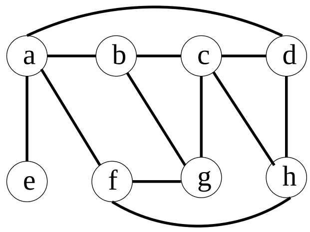
   Run Kruskal's algorithm on the graph below. Show all the different stages of the algorithm (vertex weights, tree edges, and the set of vertex subsets).



Flip over to back page ⟹

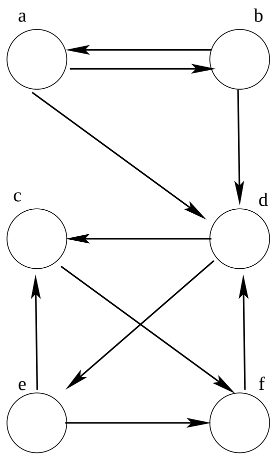
Practice Problems

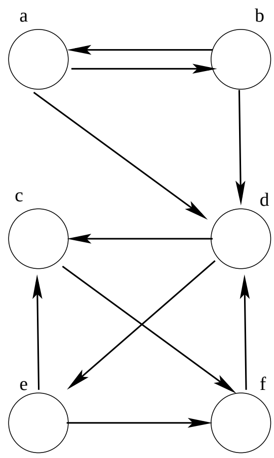
(Not required for homework credit.)



1. **Adjacency matrix and lists**
   Give the adjacency matrix representation and the adjacency lists representation for the graph above. Assume that vertices (e.g., in adjacency lists) are ordered alphabetically.

2. **DFS, BFS**
   Run BFS and DFS on the graph below, starting on vertex a. Write the visit times (and for DFS finish times) into the vertices. Assume that vertices are ordered alphabetically in the adjacency lists. For DFS also show the edge classifications.





3. **Prim**
   Run Prim's algorithm on the graph below, with start vertex a. Assume that vertices are ordered alphabetically. Show all the different stages of the algorithm (vertex weights, tree edges stored in the predecessor array, and the priority queue).