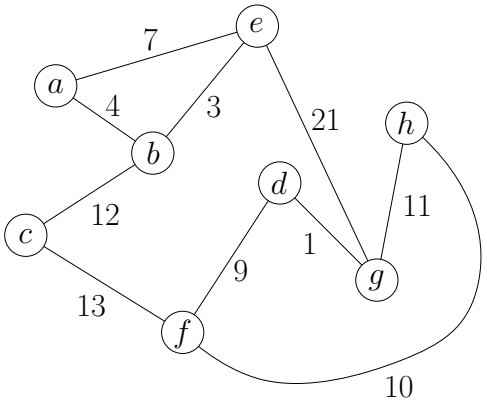
CSIT 5500 Advanced Algorithms
2020 Spring Semester
Written Assignment 3
Handed out: April 3, 2020
Due: 21:00 on April 17, 2020
Please submit a soft copy via the canvas system by the due date and time shown above. Late assignments will not be graded.

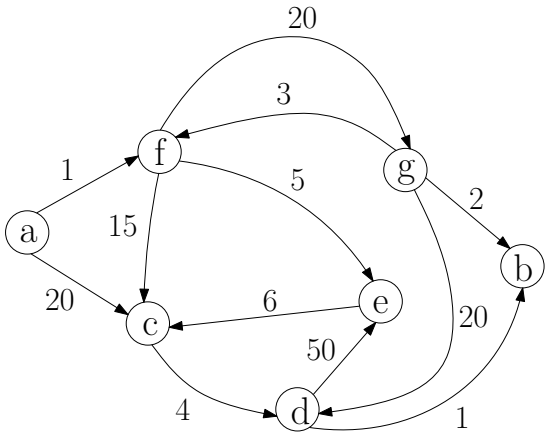
1. (10 points) Run Kruskal's algorithm on the following undirected connected graph G.



   (a) Give the order in which the edges of G are examined by the Kruskal's algorithm.

   (b) Show every intermediate forest (part of the output minimum spanning tree being built) after processing every edge in the order in (a) above.

2. (10 points) Run Dijkstra's algorithm on the following directed graph G. Use vertex a as the source. Use the same convention and notation as in the lecture notes to show the values of $D[\cdot]$ and pred$[\cdot]$ for the nodes of G. Show the graph G and the values of $D[\cdot]$ and pred$[\cdot]$ after removing and processing each vertex from Q as in the lecture notes. Either color the pointer pred$[\cdot]$ red as in the lecture notes or show the pointer pred$[\cdot]$ as a dashed arrow. A vertex should be shown shaded if it no longer belongs to Q.



3. (10 points) Consider an undirected graph G of n vertices and m edges. Every edge is given a positive edge weight. The *width* of a path P from a vertex u to a vertex v is the maximum edge weight in P. Describe an algorithm that computes a path with minimum width from u to v for every pair of distinct vertices u and v in G. Derive the running time of your algorithm. Prove the correctness of your algorithm.