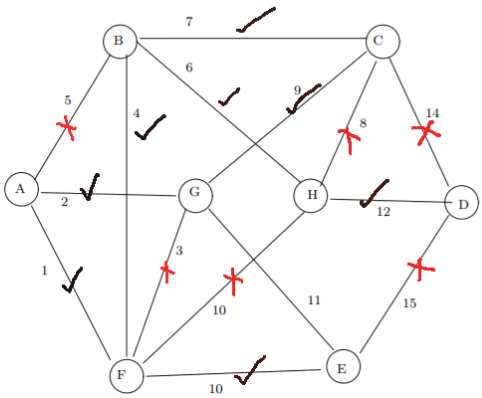
Ivan Lin
Dr. Esther Arkin
AMS301
3/19/17

Homework 6a

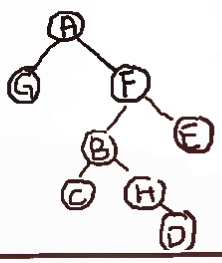
Problem A

Problem A: 2. (12 points) Consider the following graph.

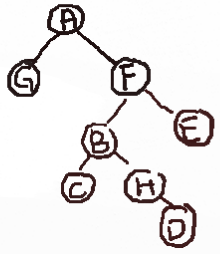


(a). Find a minimum spanning tree of the graph using Kruskal's algorithm. List the edges in the order they are put into the tree.
(b). Apply Prim's algorithm to the same graph starting with node A. List the edges, in order added to the MST.
(c). Suppose the cost of every edge touching node A is increased by a constant. Are we guaranteed that the MST remains the MST? Explain.

a)
1. $\overline{af}$ 6. $\overline{fe}$
2. $\overline{ag}$ 7. $\overline{hd}$
3. $\overline{fb}$
4. $\overline{bh}$
5. $\overline{bc}$



b)
1. $\overline{af}$ 6. $\overline{fe}$
2. $\overline{ag}$ 7. $\overline{hd}$
3. $\overline{fb}$
4. $\overline{bh}$
5. $\overline{bc}$

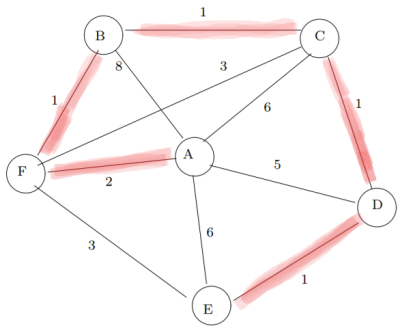


c. If the cost of every edge in the graph is increased by a constant, then the total cost of all the edges in a tree is increased by that constant times the number of edges in the tree. Since all trees of the graph have the same number of edges, the total cost for every tree of the graph increases by the same amount. As a result, the minimum spanning tree remains the minimum spanning tree.

Problem B

Start at B

A → 8 → 7 → 7 → 3
B → 0 →
C → 1 →
D → ∞ → 1
E → 1 → 1 → 1
B → C → D → F → A



(b). Suppose the cost of every edge touching node B is increased by a non negative constant. Are we guaranteed that the Shortest path tree rooted at B remains the same? Explain.

No, the shortest path tree is not guaranteed to be the same if a constant is added. The reason is that depending on the length of the paths in a tree, adding a constant to every edge will change the to the different paths based on their length. As a result, some paths may become more or less costly than others. Counterexample: