CMPSCI 311: Introduction to Algorithms **Spring 2017**

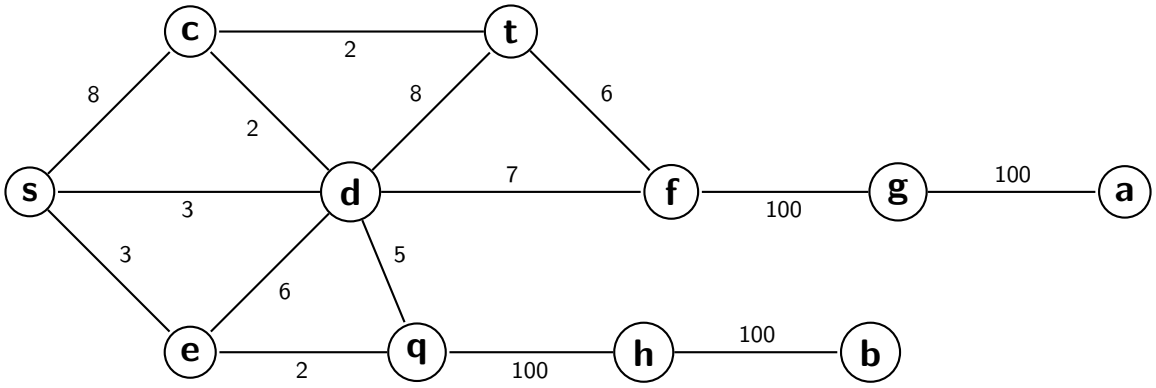
Discussion 6

Your Name: _____ Collaborators: _____

You will be randomly assigned groups to work on these problems in discussion section. List your group members on your worksheet and turn it in at the end of class.

Problem 1. Dijkstra.

(a) Execute Dijkstra's algorithm to find a shortest path from node s to rest of the nodes.



(b) Draw an edge between a and b with a weight of -1000. Is there such a thing as a shortest path between s and t in our new graph?

Problem 2. Minimum Spanning Tree.

Run Prim's and Kruskal's algorithm on the previous graph, including the negative edge that was added.

Problem 3. Minimum Spanning Tree.

Consider the Minimum Spanning Tree Problem on an undirected graph $G = (V, E)$, with a cost $c_e \geq 0$ on each edge, where the costs may not all be different. If the costs are not all distinct, there can in general be many distinct minimum-cost solutions. Suppose we are given a spanning tree $T \subseteq E$ with the guarantee that for every $e \in T$, e belongs to some minimum-cost spanning tree in G. Can we conclude that T itself must be a minimum-cost spanning tree in G? Give a proof or a counterexample.