

9. Homework

Due **Tuesday 4/21/09** before class

1. Dijkstra Variant (4 points)

Consider making the following change to Dijkstra's algorithm:

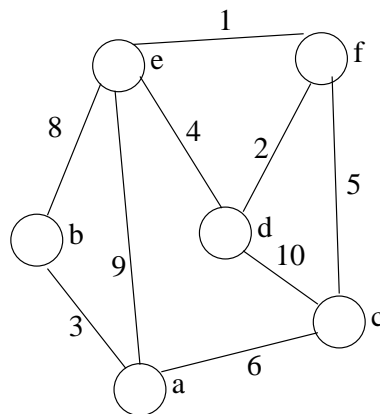
```
while |Q|>1
```

This means that the while loop runs until the queue consists of one element only. Argue why this change does not impact the correctness of Dijkstra's algorithm, i.e., the outputs of the original algorithm and the modified algorithm are the same.

2. Dijkstra (6 points)

Run Dijkstra's algorithm on the graph below, with start/source vertex a . (Assume that each undirected graph edge $\{u, v\}$ is represented using two directed edges (u, v) and (v, u) with the same weight.)

- Show all the different stages of the algorithm (vertex weights, tree edges stored in the predecessor array, and the priority queue). You may use a copy of the next page for your convenience.
- List the shortest paths from a to all other vertices.



3. Prim (5 points)

Run Prim's algorithm on the graph above, 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). You may use a copy of the next page for your convenience.

4. Kruskal (5 points)

Run Kruskal's algorithm on the graph above. Show all the different stages of the algorithm (vertex weights, tree edges, and the set of vertex subsets). You may use a copy of the next page for your convenience.

