11/16/10

10. Homework
Due **Tuesday 11/23/10** before class

1. **Dijkstra and negative edge weights (4 points)**

   Give an example of a directed connected graph with real edge weights (that may be negative) for which Dijkstra's algorithm produces incorrect answers. Justify your answer.

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.)

   (a) 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.

   (b) List the shortest paths from a to all other vertices.
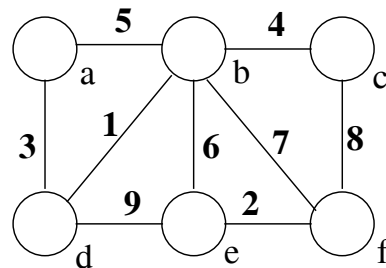
3. **Prim (5 points)**
   Run Prim's algorithm on the graph above, with start vertex a. Assume that vertices are ordered alphabetically. Show all the different stages of the algorithm (vertex weights, tree edges stored in the predecessor array, and the priority queue). You may use a copy of the next 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.

Graph 1

5 4
a b c
3 1 6 7 8
9 2
d e f

Graph 2

5 4
a b c
3 1 6 7 8
9 2
d e f

Graph 3

5 4
a b c
3 1 6 7 8
9 2
d e f

Graph 4

5 4
a b c
3 1 6 7 8
9 2
d e f

Graph 5

5 4
a b c
3 1 6 7 8
9 2
d e f

Graph 6

5 4
a b c
3 1 6 7 8
9 2
d e f

Graph 7

5 4
a b c
3 1 6 7 8
9 2
d e f

Graph 8

5 4
a b c
3 1 6 7 8
9 2
d e f

Graph 9

5 4
a b c
3 1 6 7 8
9 2
d e f

Graph 10

5 4
a b c
3 1 6 7 8
9 2
d e f

Graph 11

5 4
a b c
3 1 6 7 8
9 2
d e f

Graph 12

5 4
a b c
3 1 6 7 8
9 2
d e f