CS 535 Design and Analysis of Algorithms **Spring Semester, 2008**

Homework 6

Assigned: April 17 *Due: April 24*

Remote students: sending/mailing in on April 28 is acceptable. Email, as a pdf or postcript attachement, can be used for time-stamping and back-up, but we do ask for a hard copy of your homeworks.

1. Exercise 23.2-3 on page 573 in textbook.

2. Let $G = (V, E, c)$ be a weigted undirected graph where all the costs c_e, for $e \in E$, are strictly positive and distinct. Let T be a minimum spanning tree in $G = (V, E, c)$. Now suppose we replace the cost of each edge $e \in E$ by $c'_e = c_e^2$, creating the instance $G' = (V, E, c')$. Prove or disprove: T is a minimum spanning tree in G'.

   Now assume $s, t \in V$ are also given, and P is a shortest $s - t$ path in G. Prove or disprove: P is the shortest $s - t$ path in G'.

3. Let $G = (V, E, c)$ be a weighted undirected graph with edge costs c_e, for $e \in E$, and let T be a minimum spanning tree in G. Add an edge e' to E of cost $c_{e'}$, obtaining a new weighted graph $G' = (V, E \cup \{e'\}, c)$. Give an efficient algorithm to test if T is a minimum spanning tree in G'. Present pseudocode, analyize the running time and prove correctness. Give a $O(n)$-algorithm if you can.