COMP610 Information Structures Assignment 3

Due at 8:30 on Thursday April 14th 2016.

1. What is the maximum height of a red-black Tree with 14 nodes? Draw an example of a tree with 14 nodes that achieves this maximum height.

2. In a city there are N houses, each of which is in need of a water supply. It costs $w[i]$ dollars to build a well at house i, and it costs $c[i][j]$ to build a pipe in between houses i and j. A house can receive water if either there is a well built there or there is some path of pipes to a house with a well. Design an algorithm to find the minimum amount of money needed to supply every house with water.

3. Given a graph G, how would you use the union-find data structure to determine whether the graph is connected or not? What is the worst-case running time of your algorithm?

4. Suppose you are given a weighted undirected graph G and its minimum spanning tree T. Design an efficient algorithm that finds a second minimum spanning tree T'. That is, your algorithm should find a spanning tree T' of G such that $T \neq T'$ What is the running time of your algorithm?