CSE 326 DATA STRUCTURES
HOMEWORK 4

Due: **Wednesday, July 18, 2007** at the beginning of class.

Since we just had a midterm and the project is due soon, this homework will, hopefully be a bit shorter than the past three homeworks.

Problem 1. Range queries

Consider the task of printing in order a range of values that are stored in a binary search tree. A call to `printRange(root, start, end)` would print out all values in the tree rooted at *root* that are between *start* and *end*, inclusive. Give pseudocode for an efficient recursive implementation of this function, using the prototype `printRange(Node root, integer low, integer high)`. (Hint: when $start < \text{findMin}(root) \wedge end > \text{findMax}(root)$, your code should have the same effect as a standard in-order traversal...)

Analyze your algorithm, and prove that if the tree is complete (i.e. perfect and balanced) it runs in time $O(k + \log n)$ where n is the number of nodes in the tree, and k is the number of values printed out. (Hint: given this runtime bound, a natural proof approach would count the runtime as finding *start*, finding *end*, and doing constant work for every value in between...)

Problem 2. Disjoint Union/Find practice

Weiss problem 8.1

Problem 3. Weiss problem 8.7

Design an algorithm that generates a maze that contains no path from start to finish, but has the property that the removal of a *prespecified* wall would create a unique path. (Hint: You may use the pseudocode given to you in the slides from class. If you do, you'll only need to add two lines of pseudocode and change one existing line.)