CG Homework 3

1. Assume we have a set of n numbers stored in a balanced binary search tree T. Describe how to implement *range queries* RANGE(T, a,b) returning all the nmbers in the tree that are in the range $[a, b]$. Your solution should run in $O(\lg n + k)$ where k is the size of the output.

2. Given a set of n points in the plane, the *closest-pair problem* is to find the closest pair of points in this set. In class we talked about a divide-and-conquer solution to this problem that runs in $O(n \lg n)$.

   Describe a plane-sweep approach to the closest-pair problem.

   Hint: You'll be sweeping a vertical line across the set of points, keeping track of: (a) the closest pair so far to the left of the line; let their distance be d; and (b) all the points in a strip of distance d to the left of the line. Basically d will start out as the distance between the two left most points, and will get smaller and smaller as the sweep line advances. What are the events? What do you need to do when you sweep over the next point? What operations do you need to do on the active structure? How will you implement the AS?