Spring 1996 **CMSC 754: Homework 6** Samir Khuller

Due in class: May 6.

(1) Recall the point location data structure that we studied using the concept of partitioning using monotone chains. We first studied the basic method that gave an $O(n^2)$ space, and $O(\log^2 n)$ query time algorithm. We then saw how the gap-tree concept (see Samet's book) can be used to reduce the space bound to $O(n)$. We then studied the fractional cascading method to reduce the query time to $O(\log n)$. (This is described in Preparata and Shamos.)

Your objective is to take a non-trivial example (with at least 20 regions) and to show the exact structure that will be built after the fractional cascading method is applied. Build the example in a way that shows that fractional cascading actually helped speed up the query time. Go through a couple of queries in detail to explain how the queries are answered on your example. (Trivial queries will not get any credit!)