

## Extra Credit Homework Assignment

Due May 13

These problems are taken from de Berg et al. *Computational Geometry*. They are extra credit, worth the number of points assigned to them. They are added to your homework score *after* the curve is computed.

1. (4pts) Show that a priority search tree on  $n$  points in the plane can be constructed in  $O(n)$  time if the points are already sorted by their  $y$ -coordinate.
2. (8pts) Describe a data structure to store  $n$  intervals on the real line so that we can find the intervals that are *completely contained* in a query range  $[x_1, x_2]$  in time  $O(\log n + k)$ , where  $k$  is the number of matching intervals. Your data structure should take  $O(n \log n)$  space. (Hint: use a range tree).
3. (10pts) Give an example of a set of line segments in the plane where the greedy method of constructing an auto-partition (where the splitting line is taken that induces the fewest number of cuts) results in a BSP of quadratic size.
4. (a lot) [Open Problem!] Show that there exists a BSP of size  $O(n)$  for any set of  $n$  non-intersection line segments in the plane.