ICS 164 – Winter 2007 – Midterm

Name:

Student ID:

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Total:

1. (30 points) For each of the following algorithms, state the data structure(s) that are used as part of the algorithm. Data structures that may occur in these algorithms include the stack, queue, deque, priority queue, binary search tree, doubly-connected edge list, segment tree, interval tree, and quadtree.

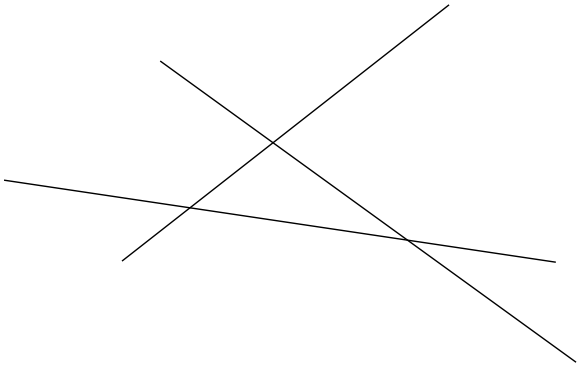
(a) Which of these data structure(s) is or are used in the Graham scan convex hull algorithm?

(b) Which of these data structure(s) is or are used in the plane sweep algorithm for reporting the intersecting pairs of line segments in a collection of line segments?

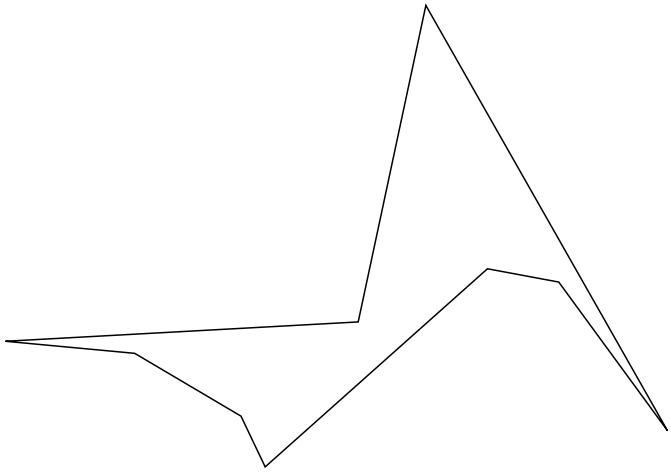
(c) Which of these data structure(s) is or are used in the incremental algorithm for constructing a line arrangement?

(d) Which of these data structure(s) is or are used in the randomized incremental algorithm for linear programming?

2. (30 points) Suppose we are representing the arrangement formed by the three line segments, below, as a doubly-connected edge list. How many objects of each type would the doubly-connected edge list use for this arrangement?



3. (30 points) Draw the triangulation of the monotone polygon below that would be produced by the left-to-right plane sweep greedy triangulation algorithm.



4. (30 points)
(a) Give projective coordinates for the Cartesian point $(2, 3)$.

(b) Give projective coordinates for the Cartesian line $y = 4x - 1$.

(c) Give projective coordinates for the Cartesian line $x = 0$.

(d) Give Cartesian coordinates for the projective point $(7, 6, 2)$.

(e) Give the equation in Cartesian coordinates for the projective line $(2, -1, 3)$.

You may use this page (or the back of the other pages) as scratch paper.