

CSE 413, Analysis of Algorithms

Fall Semester, 2004

Assignment 2: Big-O Notation and Recurrence Relations

Due Date: Sept. 17, 2004 (at the beginning of CSE 413 class)

1. Exercise 3.5, page 56. **(20 points)**

2. Solve the following recurrence relation. Give a tight close-form solution (in the big-O notation).

$$T(n) = T(n - 2) + T(2) + a * n, \text{ if } n > 2$$

$$T(n) = b, \text{ if } n \leq 2$$

where a and b are some positive constants. **(15 points)**

3. Exercise 3.20, page 58. **(20 points)**

4. Consider the problem of computing the convex hull of n input points in the plane as discussed in class. In particular, consider the following version of the algorithm.

If $n \leq 3$, then return the (easy) convex hull of the input points; otherwise, perform the following steps:

(1) In the “divide” step, find two vertical lines L_l and L_r , L_l lying to the left of L_r , such that there are $n/3$ input points lying to the left of L_l (denoted by the subset S_l), $n/3$ input points lying between L_l and L_r (denoted by the subset S_m), and $n/3$ input points lying to the right of L_r (denoted by the subset S_r);

(2) recursively compute the convex hull of each of the three subsets S_l , S_m , and S_r ;

(3) in the “combine” step, compute and return the convex hull of the n input points from the convex hulls of S_l , S_m , and S_r .

We assume that in the above algorithm, Steps (1) and (3) together take no more than $a * n^2$ time for some constant $a > 0$.

You are asked to do the following.

(i) Model the running time of the above algorithm by a recurrence relation. **(10 points)**

(ii) Solve your recurrence relation by giving a tight close-form solution (in the big-O notation). **(15 points)**

Total Points: 80