COS 423, February 8, 1996
Handout Number 2

Homework Set No. 1

Reading Assignments Read [CLR] Chapters 1, 2 and 24; read [K] Chapters 1 and 2.

Written Assignments All exercises and problems refer to the textbook [CLR] unless otherwise specified.

A. Do Problem 1-1.

B. Do Problem 1-3.

C. Do Problem 2-3.

D. Let $S = \{r_i = (x_i, y_i) \mid 1 \leq i \leq n\}$ be a set of n distinct pairs of input integers. A point r_i is called *maximal* if there exists no other point r_j satisfying $x_i \leq x_j$ and $y_i \leq y_j$. In class we outlined an algorithm which first sorts all the x_i's and then uses an additional $O(n)$ time to determine the set of maximal points in S. Give an explicit description of the $O(n)$-time second phase of the algorithm in pseudo-code.

E. For each of the following recurrence relations, determine the asymptotic growth rate of $T(n)$ up to a multiplicative factor. For example, item (a) has as solution $T(n) = \Theta(n \log n + n)$. (Hint: (c) and (e) are the harder items.)

(a) $T(1) = T(2) = 1$ and for $n \geq 3$, $T(n) = T(\lceil n/3 \rceil) + T(\lceil 2n/3 \rceil) + n$.

(b) $T(1) = 1$ and for $n \geq 2$, $T(n) = 2T(\lfloor n/2 \rfloor) + \sqrt{n}$.

(c) $T(1) = 1$ and for $n \geq 2$, $T(n) = \max\{T(k) + T(n-k) + \sqrt{k} \mid 1 \leq k \leq n/2\}$.

(d) $T(1) = 1$ and for $n \geq 2$, $T(n) = 5T(\lceil n/3 \rceil) + n$.

(e) $T(1) = 1$ and for $n \geq 2$, $T(n) = 5T(\lceil n/3 \rceil) + n \log_2 n$.

F. Do Problem 4-2.

G. Do Problem 4-7.

H. Do Exercises 24.2-1, 24.2-4.