22C : 153 **Design and Analysis of Algorithms**
Spring 2002
Homework 3
Due on April 2

1. Consider the following randomized algorithm for selecting the k'th smallest element from a set S of n distinct elements. We pick a random element $y \in S$ and parition $S - y$ into two sets S_1 and S_2 (elements smaller and larger than y respectively) as in the randomized quick-sort algorithm. Suppose $|S_1| = k - 1$; then y is the desired element and we are done. Otherwise, if $|S_1| \geq k$, we recursively find the k'th smallest element of S_1; else we recursively find the $(k - |S_1| - 1)$'th smallest element of S_2.

   Using the ideas of our analysis of the randomized quick-sort algorithm, show that the expected number of comparisons made by this algorithm is $O(n)$. (15 points)

2. Problem 26-5. (15 points)

3. Problem 26-7. (20 points)