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 partition $S - y$ 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)