CS140: Algorithms

Spring 2001

Assignment 4

This assignment is due at the start of class on Thursday, Feb. 1. You may collaborate with your classmates to complete this assignment but you should reference your collaborators. You also must thoroughly understand any solutions you submit and must do your own write-up of those solutions. This assignment is worth 100 points (65 points if handwritten).

1. Complete the last step in the analysis of Randomized Select by showing that $f(n) = O(n)$ where
   (a) $f(1) = c$
   (b) For $n > 1$, $f(n) \leq cn + \frac{2}{n} \sum_{i=\lceil \frac{n+1}{2} \rceil}^{n} f(i-1)$
2. Complete the last step in the analysis of the Select algorithm that uses median-of-medians pivots by showing that $f(n) = O(n)$ where
   (a) $f(1) = c$
   (b) For $n > 1$, $f(n) \leq cn + f(n/5) + f(3n/4)$
3. A pair of fair die are tossed. Let X be the sum of the values that appear.
   (a) What is the sample space of X?
   (b) What are the probabilities of the elementary events in the sample space?
   (c) What is $E[X]$?
   (d) What is $E[X^2]$?