CS140: Algorithms

Fall 2001

Assignment 3

This assignment is due at the start of class on Wednesday, Sept. 19. You may collaborate in small groups 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. You may not refer to solutions to assignments given in previous semesters of CS140. This assignment is worth 50 points (25 points if handwritten).

1. Prove that the expected running time of Quicksort is $O(n \lg n)$. Note: we did much of the proof in lecture but you should reiterate those steps with your own explanation.

2. Here is an inductive "proof" that $n^2 = O(n)$.

   Clearly $1^2 = O(1)$. Now suppose that $(n-1)^2 = O(n-1)$. Then

   $$n^2 = (n-1)^2 + 2n - 1 = O(n-1) + 2n - 1 = O(n).$$

   What is wrong with this "proof." Hint: try to replicate the proof using the defintion of $O(n)$ explicitly.