

CS 6505: Computability and Algorithms

Homework 3, due in class on Feb. 10

1. Give big- Θ bounds on the solutions to the following recurrences:
 - (a) $T(n) = 8T(n/2) + n$
 - (b) $T(n) = 8T(n/2) + n^3$
 - (c) $T(n) = 3T(n/2) + n$
 - (d) $T(n) = T(n/4) + 1$
 - (e) $T(n) = 3T(n/3) + n^2$
2. Given a list L of $2n$ numbers, such that the first n numbers are sorted in ascending order and the last n numbers are likewise sorted, give an algorithm that returns the median of L and runs in $O(\log n)$ time. Prove that the algorithm works and that it has the desired running time.
3. You have 25 different brands of hard drives, and want to find out which three have the top performance. You have a program that can test several hard drives simultaneously and sort them from best to worst performance, but you can only connect five hard drives to your computer at a time. It takes a long time for the test to run, so you want to run it as few times as possible.
 - (a) Specify a way to run the test suite the fewest number of times.
 - (b) Prove that there is no way to do it with any fewer runs.