

CS 5633: Analysis of Algorithms

Homework 4

1. Draw the decision tree for deterministic quicksort with an input of size 3.
2. This question is about stable sorting.
 - (a) In class we stated that counting sort is stable. Prove that counting sort is indeed stable.
 - (b) For each of the following algorithms, either prove that they are stable or give an example to show that they are not stable: (i) insertion sort, (ii) merge sort, and (iii) quicksort.
3. Try to sort the following three-digit numbers with radix sort, starting with the most significant digit:

646, 920, 619, 853, 864, 541, 196, 582, 167, 678, 661

How does swapping the order complicate the algorithm here? How can we overcome these complications (while still sorting from most significant digit to least significant digit)?

4. Suppose we are given two sorted arrays A and B which each contain n elements. Give an $O(\log n)$ time divide-and-conquer algorithm which finds the median of $A \cup B$.