

CSCI 335 Spring 2020

Homework 4 Extra Credit 1

Due 11PM April 30, 2020

Analyzing Sorting and Searching [10 Points Total]

Instructions

Read problem setup and problem carefully. Show all work. Answers without an explanation will receive no credit.

Problem Setup

In this extra credit you will explore a common scenario in computer science, you want to find an element in an array. You want to know if given an unsorted array, whether it is worth sorting and then searching or just searching. You will show approximately how many times you would have to search in order for it to be worth it to initially sort and then perform searches.

The results from this extra credit are an approximation, so they aren't practically useful since this is an asymptotic analysis. It is the line of reasoning that is important and you may encounter questions like this throughout your career.

Problem

Find a lower bound on how many searches s we would have to perform on an unsorted array of size n , where $n, s \in \mathbb{N}$ (n and s are natural numbers), for it to asymptotically cost less overall to sort the array and then perform binary searches. Use the following expressions: $c_0 \cdot n + c_1$ for linear search, $c_2 \cdot n \log n + c_3$ for merge sort, and $c_4 \cdot \log n + c_5$ for binary search, where c_i 's are constants. Make sure to indicate which constants were combined. This will not be a specific number, it will be an inequality in terms of the number of searches s , size of the array n , and constants c_i .