



# Introduction to Data Structures and Algorithms

## Homework #1

Description: This homework assignment is a short set of problems that are intended to solidify the concepts taught in class. Feel free to collaborate with others, but please write your answers separately. I am available to help as well. Please explain your answers, and partial credit is available for significant progress on a problem.

1. **Asymptotics (10%):** Prove that if  $f(n)$  is  $O(g(n))$ , and  $g(n)$  is  $O(h(n))$ , then  $f(n)$  is  $O(h(n))$ . (Hint: use the definition, and take the maximum of the  $N$ 's and the product of the  $c$ 's). Come to OH if you have questions!
2. **Data Structure (5%):** We made an assumption when performing binary search with an array. Suppose we had a basic stack or queue with minimal functionality. Assuming the elements are sorted, can we use a binary search? Why or why not? One sentence only. (Don't overthink this!)
3. **Searching (10%):** Let's make a slight modification to our binary search algorithm. Suppose now that instead of choosing the middle element each time, we choose the element that is about one-third the way through the list. What is our worst-case asymptotic time now? (No proof needed, but please explain your answer). How does this compare to the original binary search? Two to three sentences.

Total Weight: 25%.

## Beijing

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