

Homework 2

Due: Tuesday 9/24 at 11:59pm

Complete the following. Submit using Google Classroom if at all possible in a format that is easy for the TAs to read such as Google Docs, PDF, Word documents, JPEG (e.g. a picture of a paper solution), or text files. The file(s) should be named based on your name as displayed in Google Classroom. If multiple files are used, please number them.

- (8 points) Draw the result of adding the following values to an initially empty AVL tree: 205, 142, 141, 309, 320, 220, 295, 250. These values should be added one at a time in the given order. Rebalancing operations are part of the insertion so the tree should be rebalanced after each operation. Show the balanced tree after each insertion (8 figures) at a minimum; you may also show the tree before the rotations if you wish.
- (15 points) Solve the following recurrences using the technique presented in class (the recursion tree method). Give the solutions in Big-O notation.
 - $A(n) = 2A(n/3) + n$
 - $B(n) = 4B(n/2) + n^2$
 - $C(n) = 3C(n/2) + 1$
- (6 points) Use the fast integer multiplication algorithm from class to multiply 2024 and 1984. You only need to do the top-level operations using the algorithm; go ahead and use a calculator for each of the recursive calls. Be sure to show your work; no credit will be given if you only show the answer.
- (10 points) For the practice problem 1 from class, we gave an algorithm to find the peak of a unimodal sequence that begins by examining two adjacent values in the middle of the array. The first step of another divide and conquer algorithm for this problem looks at one value 1/3rd of the way into the sequence and another value 2/3rds of the way. Give such an algorithm, explain why it is correct, give a recurrence for its running time, and solve your recurrence.
- (1 point) Add a statement of collaboration to the top of your submission.