Assignment 9 - Recurrences

CS 234

due April 21th, 11:59pm

0 Introduction

This assignment is to be completed individually, but feel free to collaborate according to the course's external collaboration policy (which can be found in the syllabus). *Generative AI usage must follow course guidelines to be eligible for points.*

The deliverables consist of one `.pdf` file. The deliverables should be submitted electronically to by the deadline. Put any attribution text in the `.pdf` file. You may also consider adding an experience report to the `.pdf` describing your experience with the assignment: how long did it take, how hard/fulfilling was it, etc.

Your `.pdf` file should be named like `FLast_cs234_aX.ext` where `F` is your first initial, `Last` is your last name, `X` is the assignment number, and `ext` is the appropriate file extension. For example, Éva Tardos's `.pdf` file should be given the name `ETardos_cs234_a9.pdf`. (Éva Tardos is an award-winning algorithms researcher. She taught my algorithms course when I was an undergrad!)

1 The Only Part – Recurrence Solving

Please solve the following recurrences in your `.pdf` submission. Clearly label your responses with the task number.

1. $T(n) = \begin{cases} 0 & n \leq 1 \\ 3T(\frac{n}{5}) + n & n > 1 \end{cases}$
2. $T(n) = \begin{cases} 0 & n \leq 1 \\ 8T(\frac{n}{2}) + n^3 & n > 1 \end{cases}$
3. $T(n) = \begin{cases} 0 & n \leq 1 \\ 5T(\frac{n}{3}) + n & n > 1 \end{cases}$
4. $T(n) = \begin{cases} 0 & n \leq 1 \\ 9T(\frac{n}{3}) + n^2 & n > 1 \end{cases}$
5. $T(n) = \begin{cases} 0 & n \leq 1 \\ 10T(\frac{n}{2}) + n^3 & n > 1 \end{cases}$
6. $T(n) = \begin{cases} 0 & n \leq 1 \\ 4T(\frac{n}{4}) + n^2 & n > 1 \end{cases}$

For these tasks, it suffices to find a tight big-O bound. You may find this bound either by the tree method or by inductively verifying the tight bound.