

EL9343 Homework 2

(Due September 27th, 2021)

No late assignments accepted

All problem/exercise numbers are for the third edition of CLRS text book

1. First use the iteration method to solve the recurrence, draw the recursion tree to analyze.

$$T(n) = T\left(\frac{n}{2}\right) + T\left(\frac{n}{3}\right) + n$$

Then use the substitution method to verify your solution.

2. Use the substitution method to prove that $T(n) = 2T\left(\frac{n}{2}\right) + cn \log_2 n$ is $O(n(\log_2 n)^2)$.
3. Solving the recurrence:

$$T(n) = 3T(\sqrt[3]{n}) + \log_2 n$$

(Hint: Making change of variable)

4. You have three algorithms to a problem and you do not know their efficiency, but fortunately, you find the recurrence formulas for each solution, which are shown as follows:

A: $T(n) = 3T\left(\frac{n}{3}\right) + \theta(n)$

B: $T(n) = 2T\left(\frac{9n}{10}\right) + \theta(n)$

C: $T(n) = 3T\left(\frac{n}{3}\right) + \theta(n^2)$

Please give the running time of each algorithm (In θ notation), and which of your algorithms is the fastest (You probably can do this without a calculator)?

5. Can the master theorem be applied to recurrence of $T(n) = T\left(\frac{n}{2}\right) + n^2 \lg n$? Why does it work or not? Provide the asymptotic upper bound for this recurrence.