

CSci 231 Homework 1*

Algorithm Analysis

Reading: CLRS Chapters 1,2,3, 4 and A.1

1. Arrange the following functions in ascending order of growth rate:

$$2^{\sqrt{\log n}}, 2^n, n^{4/3}, n(\log n)^3, n^{\log n}, 2^{2^n}, 2^{n^2}$$

2. Using iteration, find a tight bound for the solution of the following recurrences:

(a) $T(n) = T(\sqrt{n}) + 1$

(b) $T(n) = 2T(n/2) + n/\lg n$

(c) $T(n) = T(n-1) + 1/n$

(d) $T(n) = 2T(n/4) + \sqrt{n}$

(e) $T(n) = 5T(n/5) + n/\log n$

3. Using substitution, find a **tight** bound for the solution of the following recurrence:
 $T(n) = 7T(n/2) + n^2$

4. Solve the recurrence below. Assume that you know that $\sum_{i=1}^n i^2 = \frac{n(n+1)(2n+1)}{6}$.

$$T(n) = \begin{cases} 1 & \text{if } n = 1 \\ T(n-1) + n(n-1) & \text{if } n \geq 2 \end{cases}$$

For the last two problems (and in general, when solving recurrences): assume $T(n)$ is constant for $n \leq c$, where you can choose c as you need it; and assume that n is a power of 2 or whatever else you need.

*Collaboration is allowed, even encouraged, provided that the names of the collaborators are listed along with the solutions. Write up the solutions on your own.