

CPS 130: Homework I (**Due September 12**)

1 Asymptotic notation

1. Obtain asymptotic upper and lower bounds for:
 - (a) $20n^5 - 1000n^4 + 10n$.
 - (b) $a^{n-1} + a^{n-2} + \dots + a + 1$.
2. Sort the following functions by their asymptotic order (see CLRS ¹ problem 3-3a for more related problems).
 $lg(lg^*n)$, lg^2n , $lnlnn$, lg^*n , $\sqrt{lg}n$
3. Solve the CLRS Problem 3-1 .

2 Sums

1. Evaluate the following sums.
 - (a) $\sum_{i=0}^n i \binom{n}{i}$
 - (b) $\sum_{i=1}^n 2^{n-i} i^2$

3 Recursion

1. Evaluate the following recurrences.
 - (a) $T(n) = 3T(n/2) + nlg n$
 - (b) $T(n) = T(n - 1) + 1/n$
 - (c) $T(n) = \sqrt{n}T(\sqrt{n}) + n$
 - (d) $T(n) = 4T(n/2) + n^2\sqrt{n}$
2. Solve CLRS Exercise 4.2-2 (on page 72). Also verify your answer by substitution method.

¹CLRS refers to the “Intro to Algorithms” book (2nd edition), by Cormen et. al

3. Solve CLRS Ex. 4.3-1 (part a only) using both the recursion tree and master theorem. Also verify your answers using substitution method.
4. Solve CLRS Ex. 4.3-4