Assignment 1

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Exercise 1

Solve the below recurrence relations using Substitution Method.

$$T(n) = \begin{cases} 1, & \text{if } n = 1. \\ T(n-1) + \frac{1}{n}, & \text{if } n > 1. \end{cases} \tag{1.1}$$

$$T(n) = \begin{cases} 1, & \text{if } n = 0. \\ T(n-2) + n^2, & \text{if } n > 0. \end{cases} \tag{1.2}$$

$$T(n) = \begin{cases} 10, & \text{if } n = 0. \\ T(n-2) + log(n), & \text{if } n > 0. \end{cases} \tag{1.3}$$

1.1 Challenging Problem

$$T(n) = 1.2 + 2.2^2 + 3.2^3 + ... + (n-1).2^{n-1} + n.2^n + 0. \tag{1.4}$$

Exercise 2

Let $f(n) = n$ and $g(n) = n^{(1+sinn)}$, where n is a positive integer. Which of the following statements is/are correct?

Statement 1 : f(n) = O(g(n))

Statement 2 : f(n) = $\Omega(g(n))$

Exercise 3

Make them in the increasing order of asymptotic complexity of functions f_1,f_2,f_3, and f_4?

$f_1(n) = 2^n$

$f_2(n) = n^{\frac{3}{2}}$

$f_3(n) = nlog_2n$

$f_4(n) = n^{log_2n}$