

Homework 3.2 - part 1

Md Salman Rahman

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1 Problem

Write a table with the processing time needed for solving a problem of size equal to 1000 in that machine using the algorithms with asymptotic computational cost specified below;

Algorithm A: $O(\log n)$

Algorithm B: $O(n)$

Algorithm C: $O(n \log n)$

Algorithm D: $O(n^2)$

Algorithm E: $O(n^3)$

Algorithm F: $O(2^n)$

Solution

Algorithm	$T(n) = \text{Number of Instruction}$	Time(seconds)
$O(\log n)$	$T(1000) = \log_2(1000) = 9.97 \approx 10$	$\frac{10}{10^7} = 10^{-6}$
$O(n)$	$T(1000) = 1000$	$\frac{1000}{10^7} = 10^{-4}$
$O(n \log n)$	$T(1000) = 1000 \log_2(1000) \approx 10000$	$\frac{10^4}{10^7} = 10^{-3}$
$O(n^2)$	$T(1000) = (1000)^2 = 10^6$	$\frac{10^6}{10^7} = 10^{-1}$
$O(n^3)$	$T(1000) = (1000)^3 = 10^9$	$\frac{10^9}{10^7} = 10^2$
$O(2^n)$	$T(1000) = 2^{1000} \approx 10^{301}$	$\frac{10^{301}}{10^7} = 10^{294}$