

Homework Assignment 01

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Due by: September 15, 2025

Course Section: CSC 4520-006

1. Give the best possible Big-O characterization for each of the following running time estimates, where n is the size of the input:
 - a. $2\log n + 100,000 \rightarrow O(\log n)$
We drop the constants because $\log n$ dominates.
 - b. $n^2 + 2n \rightarrow O(n^2)$
 $2n$ is a lower order growth so it's negligible and can be dropped.
 - c. $(2n + 1) + (2n - 1) + \dots + 5 + 3 + 1 \rightarrow O(n^2)$
This is the sum of the first $n + 1$ odd numbers, i.e. $(n + 1)^2 = n^2 + 2n + 1$
Same reason as b as to why it can be dropped.
 - d. $2^{20} + 3^{10} \rightarrow O(1)$
Pure constant (independent of n).
 - e. $1 + n^2 + 2n + n! \rightarrow O(n!)$
Factorial $n!$ grows far faster than any polynomial, so it dominates.
2. Which of the following functions

$3n$	Linear in n
$2n + 3$	Linear in n
$n^2 + n$	Quadratic dominates
$\log n^2$	Grows slower than n
$\sqrt[3]{n}$	Grows slower than linear
$\log 2n$	Sublinear

belong to

- $O(n)$: $3n, 2n + 3, \log n^2, \sqrt[3]{n}, \log 2n$
- $\Theta(n)$: $3n, 2n + 3$
- $\Omega(n)$: $3n, 2n + 3, n^2 + n$