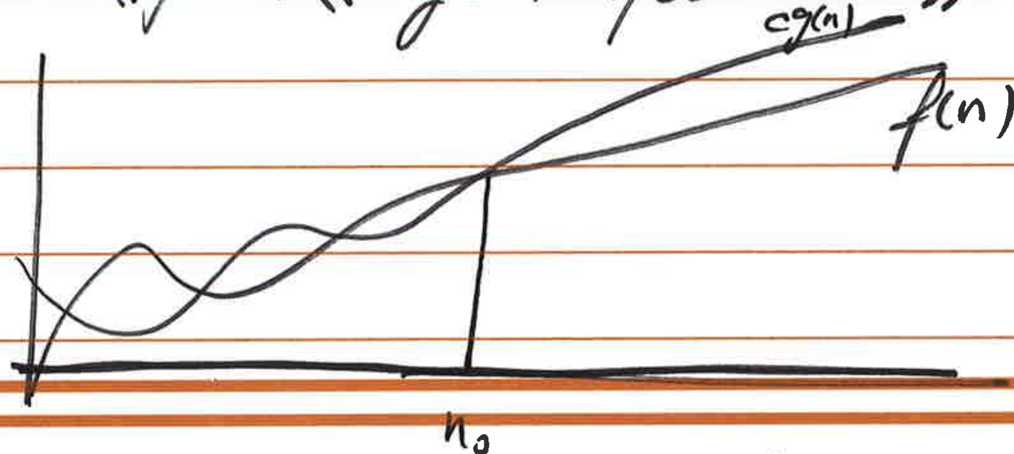
Review of
Asymptotic Notation

formally

$O(g(n)) = \{ f(n) \mid$ there exist positive constants c and n_0 such that $0 \leq f(n) \leq c g(n)$ for all $n \geq n_0 \}$



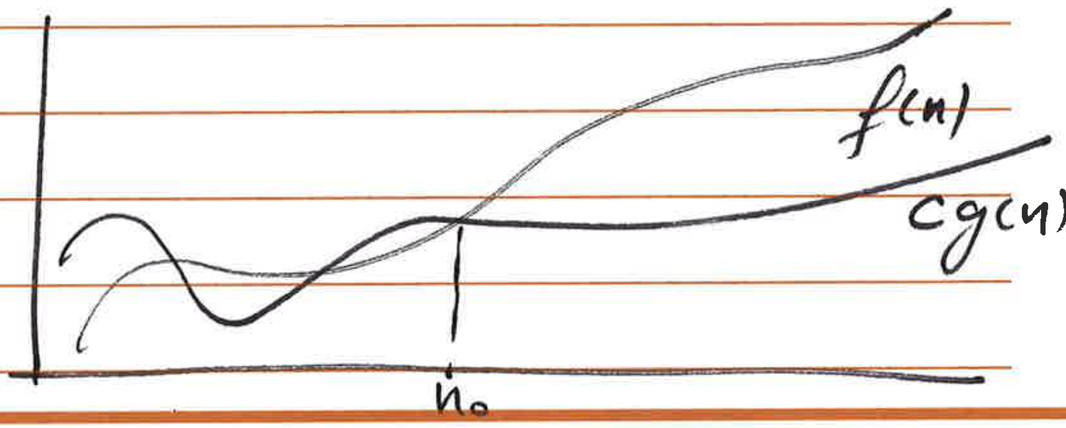
$f(n) = O(g(n))$

T any quadratic function in $O(n^2)$

T any linear " " $O(n^2)$

F any cubic " " $O(n^2)$

$\Omega(g(n)) = \{ f(n) \mid$ there exist positive constants C and n_0 such that $0 \leq C g(n) \leq f(n)$ for all $n \geq n_0$



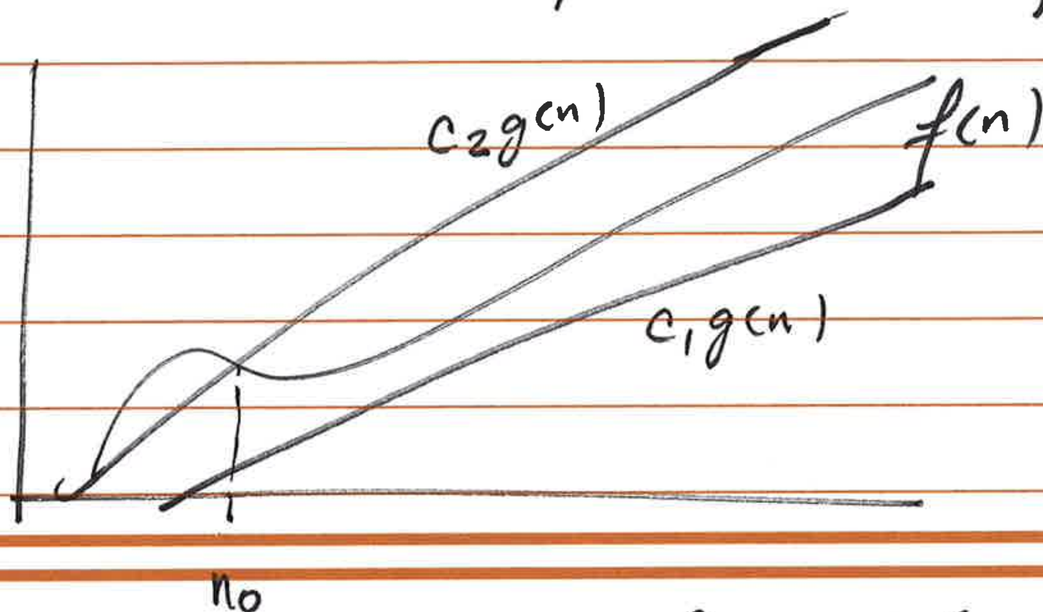
$f(n) = \Omega(g(n))$

T any quadratic function is $\Omega(n^2)$

F any linear " " $\Omega(n^2)$

T any cubic " " $\Omega(n^2)$

$\Theta(g(n)) = \{ f(n) \mid$ there exist positive constants c_1, c_2, and n_0 such that $0 \le c_1 g(n) \le f(n) \le c_2 g(n)$ for all $n \ge n_0 \}$



$f(n) = \Theta(g(n))$

	O( )	Ω( )	Θ( )
linear search	$O(n)$	$\Omega(1)$	—
binary "	$O(\lg n)$	$\Omega(1)$	—
insertion sort	$O(n^2)$	$\Omega(n)$	—
merge sort	$O(n \lg n)$	$\Omega(n \lg n)$	$\Theta(n \lg n)$
⋮			

$f(n)$

Alg A : $O(\underline{4}^n n^3 \lg n)$

$f'(n)$

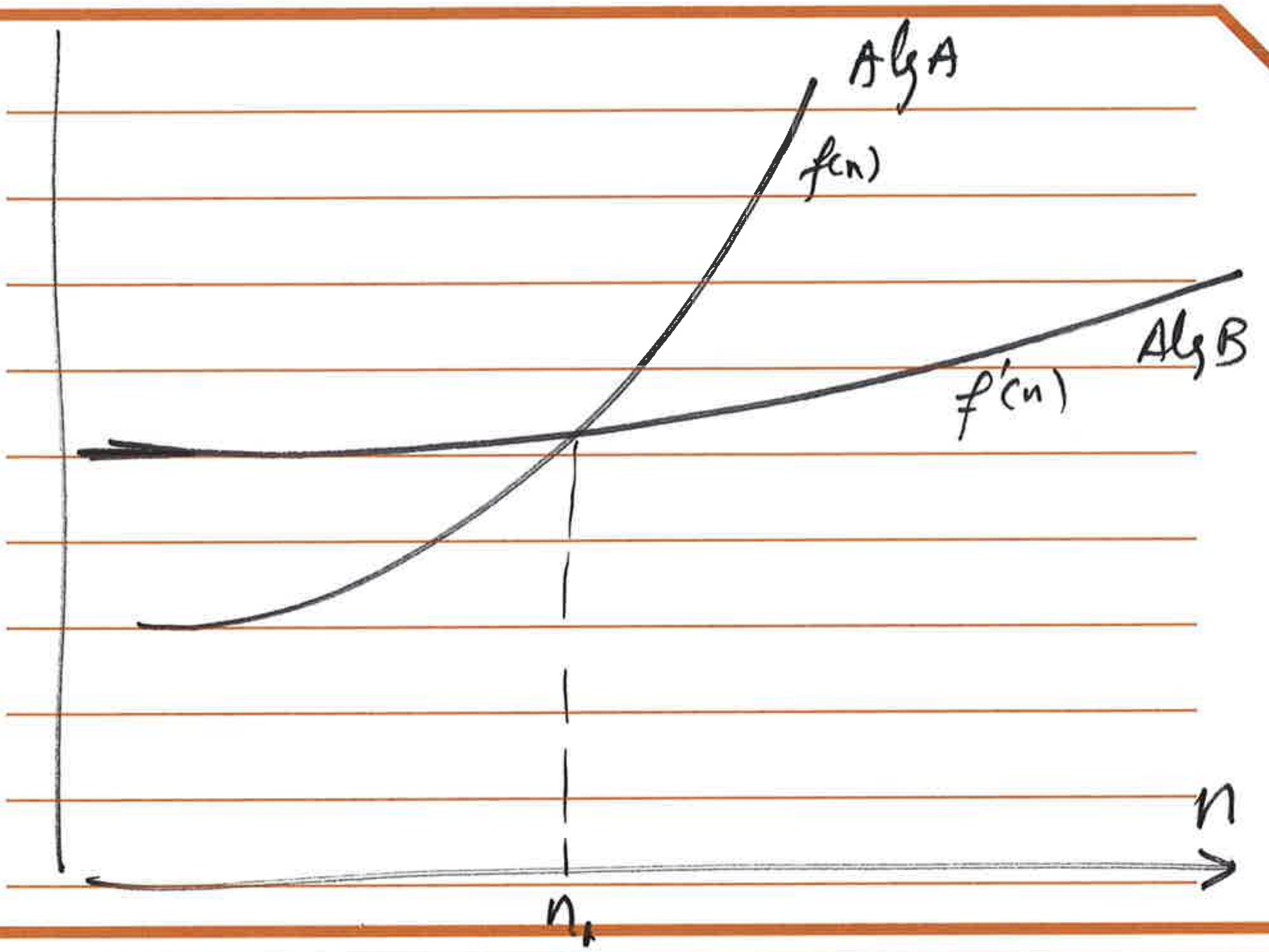
Alg B : $O(\underline{3}^n n^8 (\lg n)^2)$

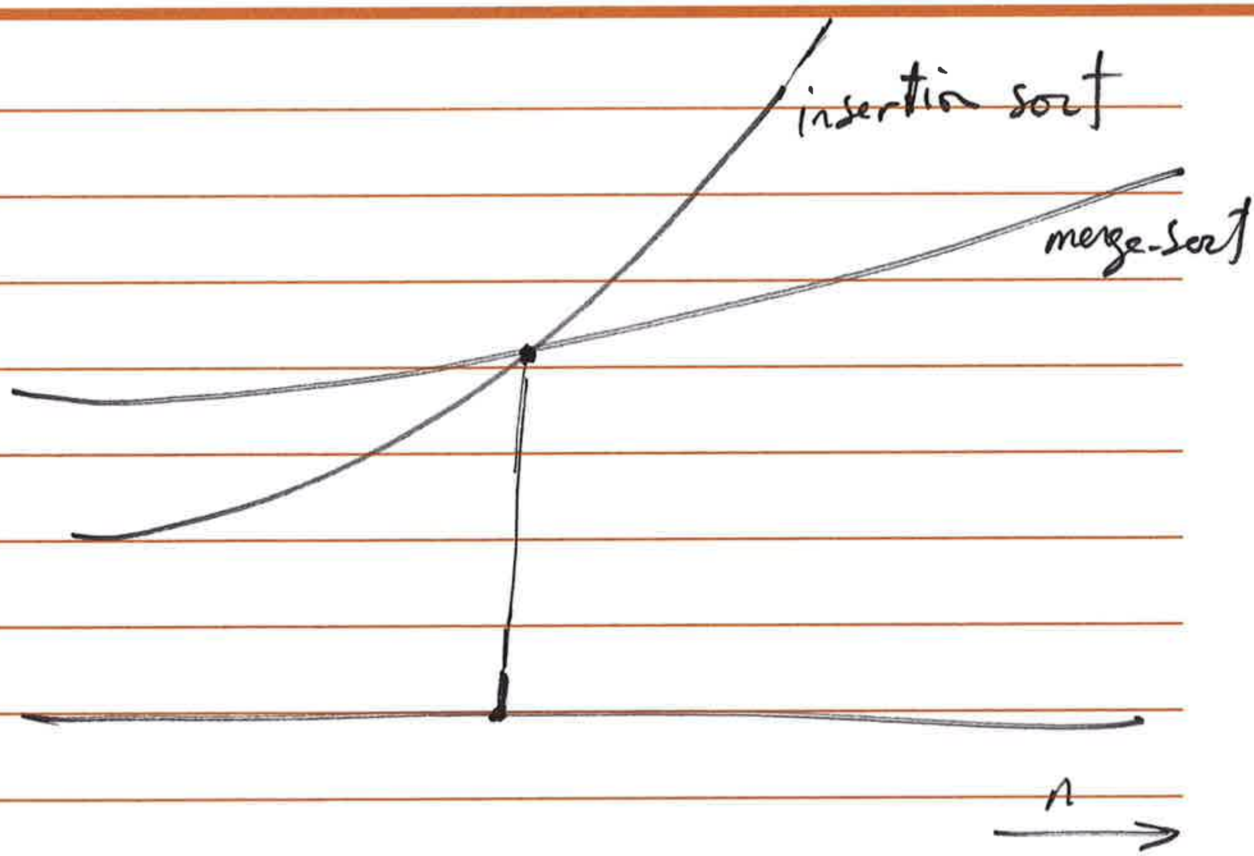
1- exponential component fastest

2- polynomial "

3- logarithmic " slowest

function $f(n)$ grows faster than function $f'(n)$


Alg A
f(n)
Alg B
f'(n)
n
n_1


insertion sort
merge-sort
n