Order of Growth Notes:

- Definitions:

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

$$\exists\, n_0, c_1, c_2 \;\forall n \geq n_0 \left(\underbrace{\overbrace{c_1 g(n) \leq f(n) \leq c_2 g(n)}^{\Theta(g(n))}}_{} \right)$$

$\Omega(g(n))$ $\qquad$ $O(g(n))$.

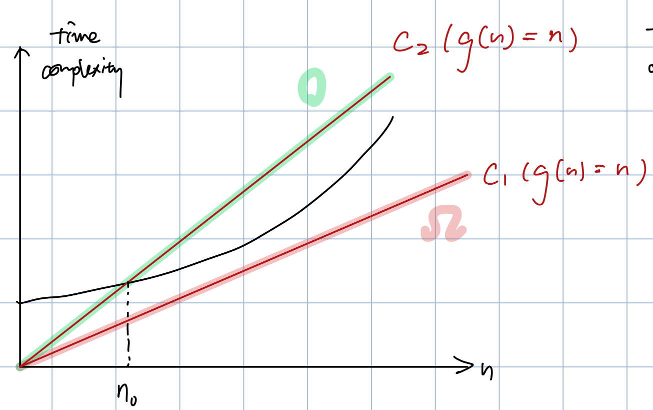
Same 'order'

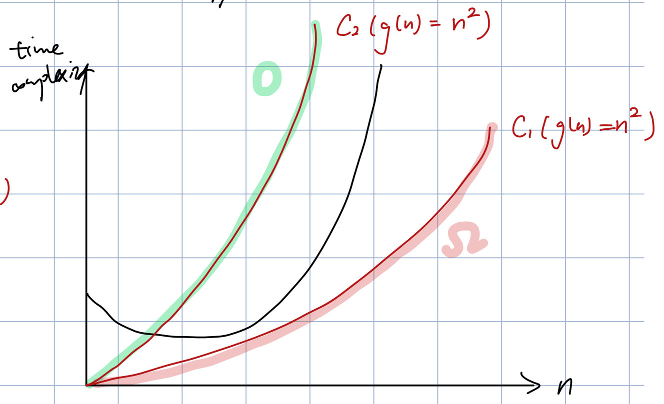
$$\Omega(g(n)) \wedge O(g(n)) \longleftrightarrow \Theta(g(n))$$

Only indicates Lower bound

Only indicates upper bound.

the more stringent bound, indicates both upper (O) and Lower (Ω) bound.





$\Theta(n)$ linear enough.

$\Theta(n^2)$ bounded by n^2 graphs

Recurrence Relation:

$$\text{Work done} = \overbrace{\text{Work to be done now}}^{\text{Deferred Op.}} + \underbrace{\text{work to be done later}}_{\text{Recursive part}}$$

$$T(n) = f(n) + T(g(n)) \Rightarrow \text{Order of Growth in time.}$$

Common recurrence relations :

Current	Arithematic reduction: $T(n) = T(n-1) + O(g(n))$	Geometric Reduction : $T(n) = T(\frac{n}{2}) + O(g(n))$
$O(1)$	$T(n) = T(n-1) + O(1)$ $T(n) = O(n)$	$T(n) = T(\frac{n}{2}) + O(1)$ $T(n) = O(\log n)$
$O(\log n)$	$T(n) = T(n-1) + O(\log n)$ $T(n) = O(n \log n)$	
$O(n)$	$T(n) = T(n-1) + O(n)$ $T(n) = O(n^2)$ $>>$	$T(n) = T(\frac{n}{2}) + O(n)$ $T(n) = O(n)$
$O(n^k)$	$T(n) = T(n-1) + O(n^k)$ $T(n) = O(n^{k+1})$	
	$T(n) = 2T(n-1) + O(1)$ $T(n) = O(2^n)$	$T(n) = 2T(\frac{n}{2}) + O(1)$ $T(n) = O(n)$