

6^n and 3^n

6^n is $O(3^n)$

~~$O(3^n)$~~

$\Theta(3^n)$

$$> 6^n = O(3^n)$$

$$\exists \{c > 0 : 6^n \leq c 3^n\}$$

$$6^n \leq c 3^n$$

$$2^n 3^n \leq c 3^n$$

$$2^n \leq c$$

c is not constant

$$6^n \neq O(3^n)$$

$$> 6^n \not\in \Omega(3^n)$$

$$\Omega(g(n)) = \{f(n) : \exists c, \underline{n_0 > 0}$$

such that $0 \leq c g(n) \leq f(n) \forall n \geq \underline{n_0}$!

$$0 \leq c 3^n \leq 6^n \quad \forall n \geq n_0$$

$$c 3^n = 2^n 3^n$$

$$c = 2^n$$

$$c = 1$$

$$3^n \leq 6^n$$

$$c = 1$$

$$\boxed{n_0 = 0.}$$

$$n \geq 0$$

$$3^n \leq 6^n$$

$$c \geq 2$$

$$n_0 = 1.$$

$$c 3^n < 6^n$$

$$n_0 \geq 2$$

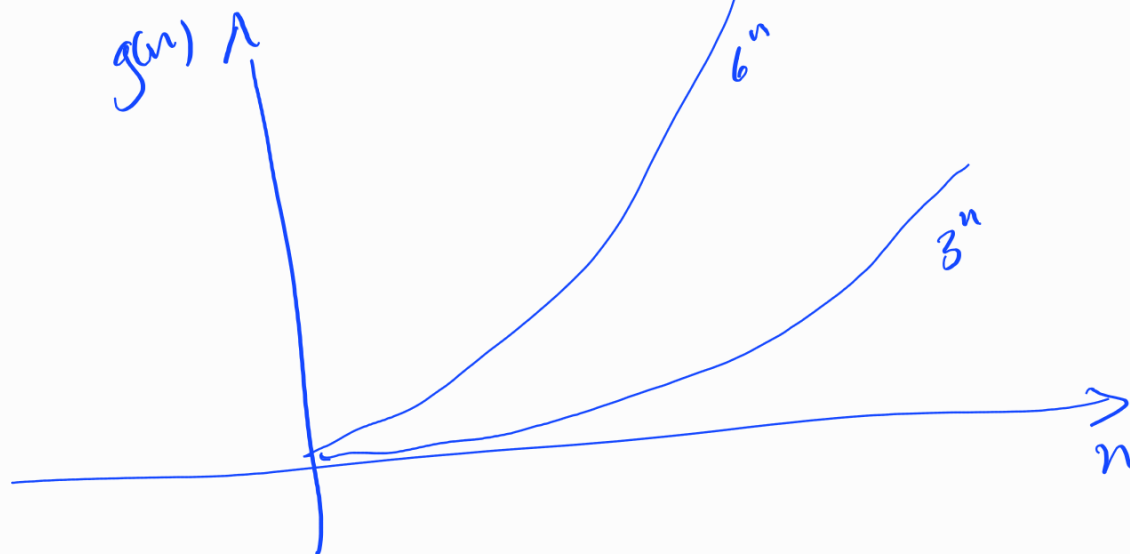
$$6^n = \Omega(3^n)$$

$$n_0 \geq 0, C=1$$

$$> 6^n \not\leq O(3^n)$$

$$\frac{6^n = O(3^n)}{\text{false}} \quad \& \quad \frac{6^n = \Omega(3^n)}{\text{true}}$$

false



$$\left\{ \begin{array}{l} O(n) \\ O(\log(n)) \\ O(n \log(n)) \\ O(n^2) \end{array} \right.$$

$$3^n \text{ is } O(6^n) \quad \text{true}$$

3 is $O(6^n)$ false
 $\Omega(6^n)$ false.
 $\Theta(6^n)$ false.

$$3^n = O(6^n)$$

$$c, n_0 > 0$$

$$3^n \leq c 6^n$$

$$n \geq n_0$$

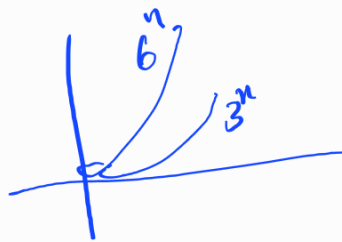
$$3^n \leq c 2^n 3^n$$

$$n_0 = 0$$

$$1 \leq c 2^n$$

$$c \geq 1$$

$$3^n \leq 6^n; n \geq 0$$



$$3^n \neq \Omega(6^n)$$

$$c 6^n \leq 3^n$$

$$c = 2^n \quad c \text{ is not constant}$$

$$\Rightarrow 3^n \neq \Omega(6^n)$$

$$\Rightarrow 3^n \neq \Theta(6^n)$$

$$3^n = \underline{\underline{\Theta(3^n)}}$$

CLRS 3.1-4

is $2^{n+1} = O(2^n)$?

$$c = 3, n_0 = 1 \quad \text{X}$$

$$2^{n+1} \leq C 2^n$$

$$\cancel{2} 2^n \leq C \cancel{2}^n$$

$$2 \leq C$$

$$\boxed{\begin{array}{l} C=2 \\ n_0=0 \end{array}}$$

is $2^{2^n} = O(2^n)$?

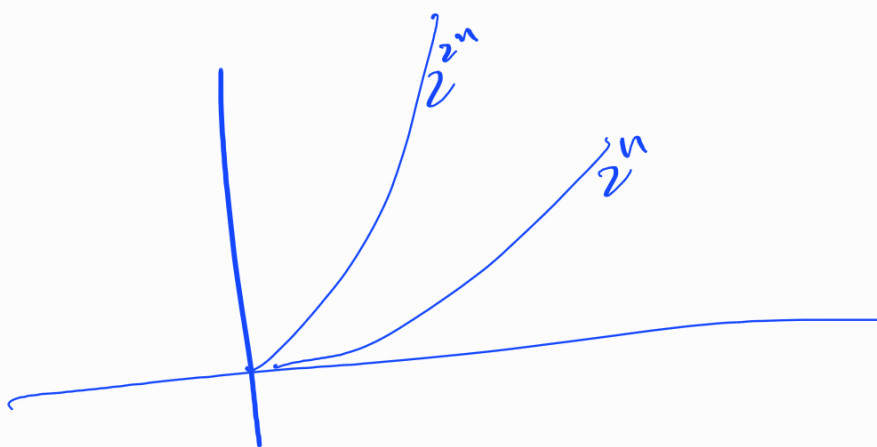
$$(2^n)^2 \leq C 2^n$$

$$2^{2^n} 2^{-n} \leq C$$

$$2^{(2^n-n)} \leq C$$

$$2^n \leq C$$

C is not constant
 $\Rightarrow 2^{2^n} \neq O(2^n)$



$2^{2^n} = \Omega(2^n)$?

$$C, n_0 > 0$$

$$2^n \mid 2^{2^n}$$

$$C 2^n \leq 2^{2^n}$$

$$C=1$$

$$2^n \leq 2^{2^n}$$

$$n \geq n_0$$

$$n_0=0$$

$$n \geq 0$$

$n=0$	1	1
$n=1$	2	4
$n=2$	4	16
$n=3$	8	64
	\vdots	\vdots

$$\underline{\underline{L \leq L}}$$

✓

$$\Rightarrow 2^{2^n} = \Omega(2^n)_n$$

