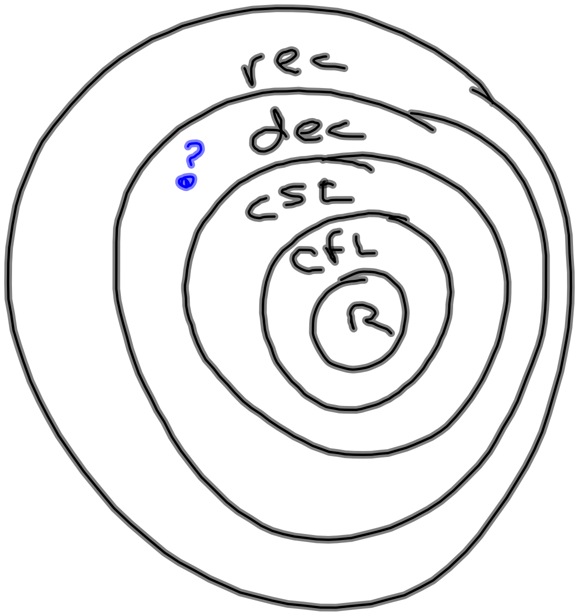
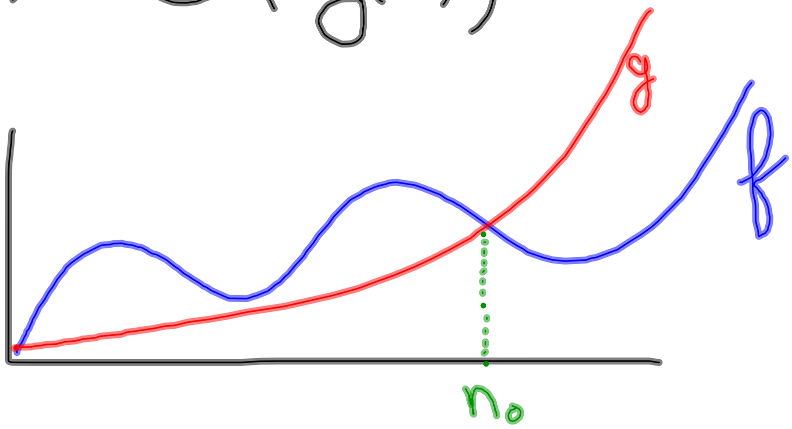

rec
dec
?
cst
cfl
R

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



if pos. int c and n_0 exist such that for every $n \geq n_0$

$$f(n) \leq c \cdot g(n)$$

$$f(n) = 5n^3 + 2n^2 + 22n + 6$$

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

is $O(n^4)$

is $O(2^n)$

is not $O(n^2)$

$$f(n) = o(g(n))$$

$$\lim_{n \to \infty} \frac{f(n)}{g(n)} = 0$$

$A = \{0^k 1^k \mid k \geq 0\}$

$|w| = n$

M_1 = on input string w

$O(n)$ 1. scan tape and reject if we find a 0 after a 1

$\frac{n}{2}$ times

$O(n)$ 2. repeat if there are both 0's and 1's on the tape.

$O(n)$ $O(n)$ 3. $\longrightarrow$ cross of a 1 and a 0.

$O(n^2)$

$O(n)$ 4. if 0's but no 1's $\rightarrow$ reject
if 1's but no 0's $\rightarrow$ reject
otherwise accept.

$$O(n^2)$$

TIME:

let $t: \mathbb{N} \to \mathbb{R}^+$

The Time complexity class $TIME(t(n))$ is the collection of all languages that are decidable by ~~a~~ some $O(t(n))$ time TM.

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so $A \in TIME(n^2)$

~~0000~~ ~~1111~~

check even $O(n)$

$O(\log n)$ cross out half of 0's and 1's

$O(n \log n)$

0000 1111

copy 0's to 2nd tape

0000 ~~1111~~

~~0000~~ $O(n)$

Let $t(n)$ be a function where
$t(n) \geq n$

Then every $t(n)$ time multitape
TM has an equiv. $O(t^2(n))$
single tape TM.

- non-det TM (time $t(n)$)

$2^{O(t(n))}$ time single tape
TM