Yue Li HW 1

No. CPSC 464
Date 1/9/2018

Ex 3.1-2 : $C_1 \le (1+\frac{a}{n})^b \le C_2$.

① when $a \ge 0$, for any $n \ge 1$

$C_1 = 1$, $C_2 = (1+a)^b$, $n_0 = 1$

② when $a < 0$, for any $n \ge n_0 = \lceil -2a \rceil$

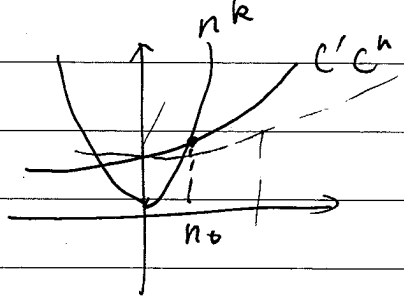
$C_1 = (\frac{1}{2})^b$, $C_2 = 1$, $n_0 = \lceil -2a \rceil$

Problem 3-2.

parts b: A B O o Ω ω Θ

n^k c^n ~~No~~ Yes ~~No~~ Yes ~~Yes~~ ~~No~~ No

No No



$\lim_{n\to\infty} \frac{n^k}{c^n} = 0$

parts d: 2^n $2^{n/2}$ No No Yes Yes. No

$\lim_{n\to\infty} \frac{2^n}{2^{n/2}}$ $\lim_{n\to\infty} 2^{\frac{n}{2}} = \infty$

Ex. 8.1-3. According to theorm 8.1.

① $\frac{n!}{2} \le 2^h \Rightarrow h \ge \lg(\frac{n!}{2})$

$= \lg n! - 1$

$= \Theta(n\lg n) - 1$

$= \Theta(n\lg n)$

∴ No linear time exists

$\frac{1}{n}$ of inputs:

No.

Date

② $h \geq \lg\left(\frac{n!}{n}\right) = \lg(n!) - \lg n$

$= \Theta(n \lg n) - \lg n$

$\therefore = \Theta(n \lg n)$.

$\therefore$ No linear time

③ $\frac{1}{2^n}$ of the inputs.

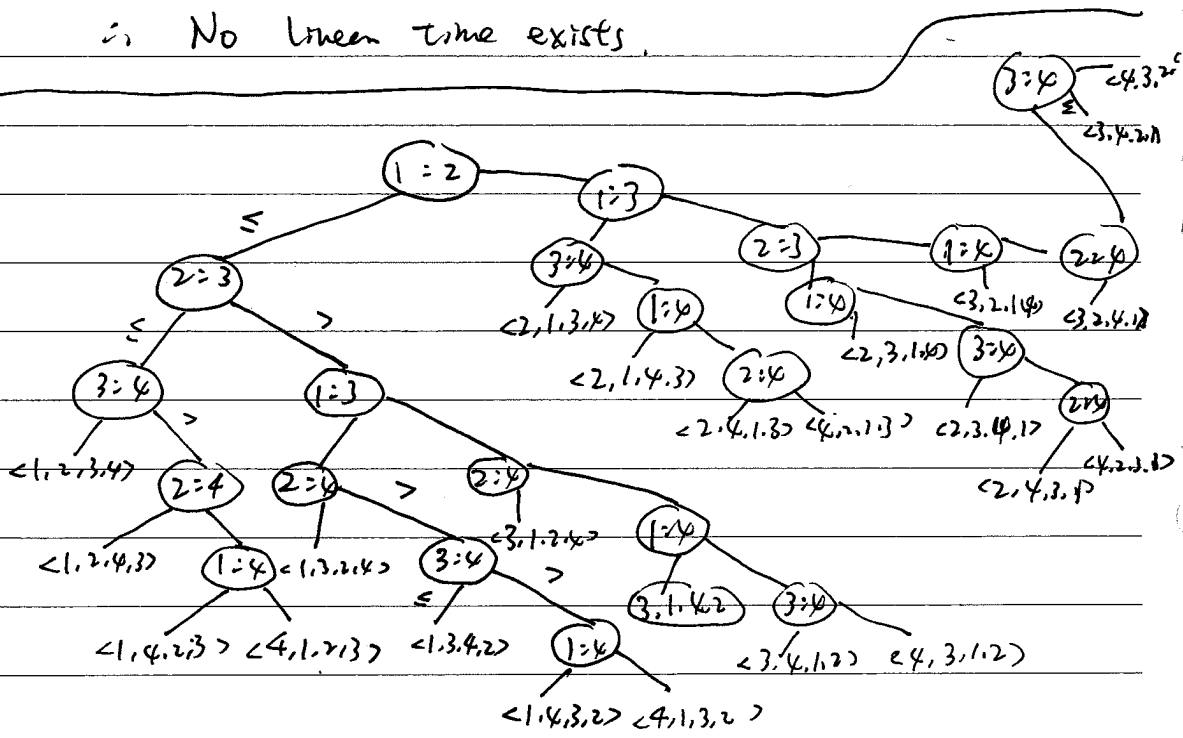
$h \geq \lg\left(\frac{n!}{2^n}\right) = \lg(n!) - \lg(2^n)$

$= \Theta(n \lg n) - n$

$= \Theta(n \lg n)$

$\therefore$ No linear time exists.

(A)



Decision tree for Insertion Sort of 4 elements

Delijia®

Yue Li

No. CPSC411 HW1

Date 1/9/2008

(B). $O(n \lg\sqrt{n}) = O(n \lg n^{\frac{1}{2}}) = O(\frac{n}{2} \lg n) = O(n \lg n)$.

∴ This is possible, for example, the Heapsort's runnng time is $\Theta(n \lg n)$.

(C) If the claim is right, then ~~the~~ each call to Max-Heapify(A, i) ~~with~~ takes time $O(1)$

Therefore the Heapsort Algorithm will take time $O(n \times 1) = O(n)$.

This violates the $\Omega(n \lg n)$ lower bound for comparison based sort, therefore, the claim is not correct.

No.

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