15210: Parallel and Sequential Data Structures and Algorithms

MiniLab

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5.1

A man in shirt and tie is staring at some kind of food in his hand with a “this is disgusting” face.

5.2

1. They are following the policy. Students are allowed to talk about assignment with the “whiteboard policy”. The students talked about the assignment without taking any notes, and they started actually working on it after more than 2 hours.

2. Students are not allowed to take hints or solutions from others, despite Jon is not in 210 class. Even if Ishmael didn’t directly use what Jon told him and regard this as a discussion, Ishmael is not allowed to take notes during the discussion, so he’s still breaking the policy.

3. Though they are not talking about homework assignment, what they do involves some code writing related to homework, and the text editor can be regarded as a way of taking notes. So strictly speaking, they are breaking the policy. The best way is to go to the office hour and ask the staff for help.

5.3

50%

5.4

65214783

5.5

1.

By definition, since $f \in O(h)$, we have

$$\exists N_1 \in \mathbb{N}, c_1 \in \mathbb{R}, s.t. \forall n > N_1, f(n) \le c_1 g(n)$$

Similarly, since $g \in O(h)$

$$\exists N_2 \in \mathbb{N}, c_2 \in \mathbb{R}, s.t. \forall n > N_2, g(n) \le c_2 h(n)$$

Let $N_0 = \max(N_1, N_2)$, $c_0 = c_1 \cdot c_2$, we have

$$\exists N_0 \in \mathbb{N}, c_0 \in \mathbb{R}, s.t. \forall n > N_0, f(n) \le c_1 g(n) \le c_1 c_2 h(n) = c_0 h(n)$$

By definition, that is $f \in O(h)$.

2.

Counter Example: $f(n) = n$, $g(n) = n^2$

For $\forall n \ge 1, f(n) \le g(n)$, that is, $f \in O(g)$

However, on the other hand, let $n = \max(N, \lceil c \rceil) + 1$, so we have

$n > N$, and $n > c \Leftrightarrow n^2 > cn \Leftrightarrow g(n) > cf(n)$

That is, by definition, $g \notin O(f)$

5.6

1.

$\langle e : S_{2k+1}, 0 \le k \le \lfloor n/2 \rfloor - 1 \rangle$

2.

$\langle e : S\langle i, i+k-1 \rangle, 0 \le i \le n-k, 2 \le k \le n \rangle$

5.7

$\langle e : p \in A, p \notin B \rangle$

This function is to find all the elements in A that do not have any duplicates (elements with same value) in B.

Or, use the concept of set, $A - B (A \setminus B)$