Tutorial 1

Graded

Student

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Total Points

3 / 3 pts

Question 1

Q1 **3** / 3 pts

✔ **+ 1.5 pts** Claiming that $f(n) = O(n)$ implies that there exist fixed constants n_0, k such that for all $n > n_0$, $f(n) \leq kn$

✔ **+ 1.5 pts** Identifying that the k in the induction is not a fixed constant

+ 0.6 pts Wrote unable to solve the question

+ 0 pts Incorrect

COL351: Analysis and Design of Algorithms
Tutorial 1

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Entry number: 2022CS11596

Date: August 01, 2024
Group: 3

Inductive Hypothesis:- $f(n) = O(n)$

→ $\exists\ C, n_0$ such that $f(n) \leq Cn \quad \forall n \geq n_0$ ----- (1)

Base Case:- $f(1) = 1 = O(1)$

From this we conclude that $\boxed{1 \geq n_0}$ and

$1 \leq C(1) \rightarrow \boxed{C \geq 1}$

Inductive Step:- $f(n+1) = n+1 + f(n)$

$\leq n+1 + Cn = (n+1)\left(C + \frac{1}{n+1}\right)$

Since "constant" C is not the same here, we cannot conclude $f(n) = O(n)$

Mistakes in the proof:-

① Inductive Step :- not showing that same constant C is there.

② Not using the definition of $O(\ )$ to show $\exists\ n_0, C$ s.t. $f(n) \leq Cn \quad \forall\ n \geq n_0$