CSC236 Term Test 1 Version 2 Solution

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Question 1

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Rough Work:

Define $P(n) : f(n) = 3^n$.

I will use complete induction to prove that $\forall n \in \mathbb{N}, n > 2 \Rightarrow C(n)$.

1. Inductive Step

   Inductive Step:

   Let $n \in \mathbb{N}$. Assume $n > 2$. Assume $H(n) : \bigwedge_{i=0}^{n-1} P(i)$. I will prove $C(n)$ follows. That is, $f(n) = 3^n$.

2. Base Case ($n = 0$)

Base Case ($n = 0$):

Let $n = 0$.

Then, the definition of $f(n)$ tells us $f(n) = 1$.

Then, we have

$$f(n) = 3^0 \tag{1}$$
$$= 3^n \tag{2}$$

Thus, $P(n)$ follows.

3. Base Case ($n = 1$)

Base Case ($n = 1$):

Let $n = 1$.

Then, the definition of $f(n)$ tells us $f(n) = 3$.

Then, we have

$$f(n) = 3^1 \tag{3}$$
$$= 3^n \tag{4}$$

Thus, $P(n)$ follows.

4. Base Case ($n = 2$)

Base Case ($n = 2$):

Let $n = 2$.

Then, the definition of $f(n)$ tells us $f(n) = 9$.

Then, we have

$$f(n) = 3^2 \tag{5}$$
$$= 3^n \tag{6}$$

Thus, $P(n)$ follows.

5. Case ($n > 2$)

Question 2

Question 3