CSC 225 LaTeX sample

Insert Name Here

May 26, 2017

This is some ordinary text. LaTeX ignores single newlines (so two adjacent lines appear as part of the same paragraph).

Leaving a blank line starts a new paragraph.

Question 1

Here is some math: $n^2 + n - 1000 > 0$ for all $n > n_0$

Bad attempt at writing n to the power 123: $n^1 23$.

Better attempt at writing n to the power 123: n^{123}.

Square root of 2 times n plus 1: $\sqrt{2n+1}$

Here is a simple fraction: $\frac{1}{2}$

Here is a less simple fraction: $\frac{n^2+n+100}{\sqrt{2}}$

Using the definition of Big-O, we can prove that $n^2 \in O(n^3)$ and $5n^3 \in \Theta(n^3)$.

The limit of $\frac{n^2+n+100}{n^{\sqrt{n}}}$ converges to 0 as n goes to infinity.

The limit of

$$\frac{n^2+n+100}{n^{\sqrt{n}}}$$

converges to 0 as n goes to infinity.

By induction, we can prove that

$$\sum_{i=0}^{n} 2^i = 2^{n+1} - 1$$

If $A = \{1, 2, 3\}$ and $B = \{4, 5, 6\}$, then

$$A \cap B = \emptyset$$

Question 2

Sometimes, you may want to include raw text (including $ and { characters) without having to escape all the special characters.

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This is raw text.
Look at all these special characters: !@#$%^&*{}
LaTeX code in verbatim text is ignored: \begin{document} $n \leq n^2$ \end{document}
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Question 3

Below is a proof of the identity

$$\sum_{i=0}^{n} i = \frac{n(n+1)}{2}$$

for all $n \geq 0$.

Basis: When $n = 0$, $\sum_{i=0}^{n} i = 0$, and $\frac{n(n+1)}{2} = 0$, so the identity holds.

Induction Hypothesis: Suppose $\sum_{i=0}^{n} i = \frac{n(n+1)}{2}$ for some $n \geq 0$.

Induction Step: Consider $n + 1$.

$$\begin{aligned}
\sum_{i=0}^{n+1} i &= (n+1) + \sum_{i=0}^{n} i \\
&= (n+1) + \frac{n(n+1)}{2} && \text{(By the induction hypothesis)} \\
&= \frac{2n + 2 + n^2 + n}{2} \\
&= \frac{n^2 + 3n + 2}{2} \\
&= \frac{(n+1)(n+2)}{2}
\end{aligned}$$

Therefore, the identity holds for $n + 1$, and by induction, the identity holds for all $n \geq 0$.

Question 4

Here is some pseudocode for an algorithm which computes the sum

$$\sum_{i=0}^{n} i$$

and returns the computed value.

$x \leftarrow 0$
for $i \leftarrow 0, 1, 2, \ldots, n$ **do**
  $x \leftarrow x + i$
end for
return x

The pseudocode can also be written with a while loop.

$x \leftarrow 0$
if $n = 0$ **then**
  return 0
end if
$i \leftarrow 0$
while $i \leq n$ **do**
  $x \leftarrow x + i$
  $i \leftarrow i + 1$
end while
return x