

Re: Cantor Confusion

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- *From:* David Marcus <DavidMarcus@xxxxxxxxxxxxxxxx>
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Tony Orlow wrote:

David Marcus wrote:

Tony Orlow wrote:

Now, sequences may be said to derive from ordered sets, but sets are said to be determined solely by membership, with order unimportant. So, the notion of a sequence derives really from an inductive definition such as Peano's, and not from the one primitive in set theory, membership, alone. The notion of order is not captured by "is an element of". Do you disagree?

Of course I don't agree. You seem to be saying that infinite sequences can't be handled in ZFC. Since ZFC has no trouble modeling the natural numbers and defining functions, it clearly has no trouble acting as a foundation for all of calculus and analysis.

Is there not a single primitive in set theory, namely, \in (element of)?

Sure. But that just says that there is only one relation that is built into the language of ZFC. We are perfectly free to define new stuff, just as we do in any math class or book.

How is order derived from that,

In the usual way. If we model the natural numbers as $0 = \{\}$, $1 = \{0\}$, $2 = \{0,1\}$, then we can define $n < m$ to mean $n \in m$. We then define \mathbb{Z} , \mathbb{Q} , \mathbb{R} in the usual way from \mathbb{N} and define addition, multiplication, and order for all of them. Haven't you seen the constructions?

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and why is it not applicable in the case of the staircase?

For any given n , the number of steps, the staircase is defined as the sequence of segment offset pairs:

$$(x=1 \rightarrow n: \{(0, 1/n), (1/n, 0)\})$$

What do you mean "segment offset"? If $n = 2$, then you wrote something like

$$(0,1),(1,0),(0,0.5),(0.5,0)$$

Do you mean the staircase is the path connecting the points

$$(0,0),(0,0.5),(0.5,0.5),(1,0.5),(1,1)$$

?

The diagonal may be divided into corresponding pairs of segments with the same overall segment offset:

$$(x=1 \rightarrow n: \{(\sqrt{2}/2n, \sqrt{2}/2n), (\sqrt{2}/2n, \sqrt{2}/2n)\})$$

The segments in the first are always vertical or horizontal, while those in the second are all diagonal. The point set interpretation does not catch this. Why?

What "point set interpretation"? What doesn't it catch?

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David Marcus

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