Re: Logarithm of transfinite numbers

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- *From*: matt271829−news@xxxxxxxxxxx
- *Date*: 15 Mar 2006 17:58:59 −0800

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stephen@xxxxxxxxxx wrote:

> matt271829−news@xxxxxxxxxxx wrote:
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> > Randy Poe wrote:
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> > > matt271829−news@xxxxxxxxxxx wrote:
> > >
> > > It doesn't seem right because it isn't right. The bit string
> > > representations of natural numbers, whatever representation
> > > you choose, consist of only a countable subset of the
> > > uncountable bit strings of length aleph_0.
> > > For instance
> > > you might choose to represent the natural numbers as
> > > ...001, ...010, ...100, ...1000, i.e, infinite bit strings where
> > > only
> > > a single bit is nonzero.
> >
> > Yes, we *can* represent them this way, but we can already list them as
> > 1,2,3,4... which we know is countable. You're just putting one bit in
> > the positions 1,2,3,4... so what new does this tell us?
> >
> > Imagine instead that we *do* represent them in proper binary form. We
> > still need aleph_0 bits, and every arrangement of those aleph_0 bits
> > seems to map to a unique natural number.
>
> No, every arrangement of those aleph_0 bits does not seem to map
> to a unique natural number. Which natural number is mapped to
> ..1111111111111
> or
> ..0101010101010

I assume ".." means a (countably) infinite series. They would both have to be non−finite, I suppose, if that's what you mean. Are you saying, very roughly speaking, that the problem is that the "number infinity" appears infinitely many times in all those arrangements of aleph_0 bits?

> Only the bit strings which have an infinite number of leading zero's correspond to a natural number, and there are only aleph_0 such bit strings.
>
> > This is where it goes wrong,
> > and where the flaw in the logic must lie. It seems to me that we need to somehow show that this one−to−one mapping can't be made.
>
> That is what Cantor did all those years ago.

Didn't he go bonkers or something? I can't say I'm surprised!

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