Re: An uncountable countable set

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- *From*: "Dik T. Winter" <Dik.Winter@xxxxxx>
- *Date*: Sat, 8 Jul 2006 02:10:06 GMT

In article <J21Gtn.BCI@xxxxxx> "Dik T. Winter" <Dik.Winter@xxxxxx> writes:

Let me expand on this.

> In article <1152282364.618937.306970@xxxxxxxxxxxxxxxxxxxxxxxxxxx>
> mueckenh@xxxxxxxxxxxxxxxxx writes:

You start with the list of natural numbers in unary notation:
A0 = 0.
A1 = 0.1
A2 = 0.11
A3 = 0.111
...
calculate the diagonal number K:
K = 0.111...
and claim that K equals An for some value of n.

Note the following:

> > It is not by pure accident that I chose 0.111... . This number has also
> > a meaning as decimal representation of 1/9. So we can do the
> > calculations.

Indeed. Let's do the calculations, and let each An also have the meaning as
decimal representation, so
An = (1 − 10^(−n))/9
and now you claim that for some n
(1 − 10^(−n))/9
eqals K = 1/9.

If that were true, there must be some n such that 10^(−n) equals 0.

> > may not, simply cannot occur. We get from (2)
> > A p E n : p = n
> > and by construction of n = 0.111...1 we obtain that all 1's in K

> coincide with the 1's of n.

Right. But this does *not* prove that there is an n that is equal to K.
To reformulate clearly
For all p there is an n such that An[p] = K[p]

This was not entirely correct:
For all p there is an n0 such that for all n >= n0 An[p] = K[p].

this does *not* imply that
There is an n such that for all p An[p] = K[p],
which is what you are arguing.

Pray explain how you come (in logical steps) from the first statement
to the second.

Note that when we expand the An's with an infinite (countable, mind) sequence
of digits 0 we can do something different. After the decimal point we change
each 0 to 1 and each 1 to 0. We get the following sequence:
A0 = 0.11111111...
A1 = 0.01111111...
A2 = 0.00111111...
and so
K = 0.000000...
Now we see:
For all p there is an n0 such that for all n >= n0 An[p] = K[p].
and your claim is that from that it follows that
There is an n such that for all p An[p] = K[p],
But as An = 1/(9 . 10^n), this would imply that K (the limit of the sequence)
must be in the list and for some n, An must be 0.

So, are you now arguing that the limit of a sequence is an element of that
sequence? Or what else? And if so, for what natural number (eh, finite...)
is 1/(9 . 10^n) equal to 0?
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dik t. winter, cwi, kruislaan 413, 1098 sj amsterdam, nederland, +31205924131
home: bovenover 215, 1025 jn amsterdam, nederland; http://www.cwi.nl/~dik/
.