Re: Is e^x zero in some extended number system?

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- *From*: David W. Cantrell <DWCantrell@xxxxxxxxxxx>

- *Date*: 30 Jan 2006 15:37:45 GMT

"Dave L. Renfro" <renfr1dl@xxxxxxxxx> wrote:

To answer the question in your title: Sure.
In [−oo, +oo], the two−point extension of the reals, we have e^(−oo) = 0.
But I certainly suppose you already knew that.

David Cantrell

> I came across the following a couple of days ago
> and I'm curious if any related work has been done
> along these lines.
>
> Paul Dienes, "The exponential function in linear algebras",
> Quarterly Journal of Mathematics (Oxford) 1 (1930), 300−309.
> http://www.emis.de/cgi−bin/JFM−item?56.0151.02
>
> The text of the first two paragraphs follows.
>
> "The introduction of complex numbers was chiefly
> suggested by the problem of determining the zeros
> of polynomials. Some integral functions, such as
> e^x, have no zero in the field of complex numbers.
> This fact suggests the following question. Can we
> generalize the idea of number to such an extent
> that the exponential function may have a zero in
> the extended field?"
>
> "We shall prove in this Note that the exponential
> function has no zero in the linear associative
> algebra to a finite base, and that it has no
> zero in finite non−associative linear algebras.
> [Dienes assumes, of course, that the algebra
> product has a multiplicative identity.] This
> result extends to a large class of algebras to
> an infinite base. In particular, the exponential
> function has no zero in the tensor algebra of
> relativity theory and it misses only singular
> tensor values which do not divide some tensor.
> Moreover, in Hilbert's [*] algebra of infinite

> bounded matrices, so important in atom mechanics,
> the exponential function has no absolutely
> bounded matrix zero."
>
> [*] "D. Hilbert, 'Grundz=FCge einer allgemeinen
> Theorie der linearen Integralgleichungen',
> Leipzig (1912), pp. 128−9."
>
> Dave L. Renfro
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    - ◊ *From:* Dave L. Renfro

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