Re: Real Tetration Solution

Source: http://sci.tech−archive.net/Archive/sci.math/2005−11/msg00232.html

- *From*: "Ioannis" <morpheus@xxxxxxxxxxxx>
- *Date*: Wed, 2 Nov 2005 14:50:24 +0200

Ÿ "Andrew Robbins" <and_j_rob@xxxxxxxxx> -³Á±Èµ ÃÄ¿ ¼®½Å¼±
news:18959713.1130908349752.JavaMail.jakarta@xxxxxxxxxxxxxxxxxxxxxxxxx
>
> Hi,
[snip]

> Most of my research recently has been numerical, I've tried to extend tetration algebreicaly, as have many others, without much success. When I focused purely on numerical solutions, I started trying to find different ways of stating the problem of tetration. I started by assuming that the solution be infinitely differentiable, rather than simply continuous, and also felt that monotonic, or always positive derivatives were neccessary. So I tried plugging the conditions into Solve[] because DSolve[] wacks out, and still no solution. I tried using series expansions around several different expansion points, and still no solution. Some points do give a solution, but its oscillating, and changes as soon as you add one term to the series expansion, so the sequence of series terms doesn't converge.
>
> Recently I did something different, and it worked! I did it! I solved the problem of continuous tetration! But in a very roundabout way. I did it by providing the conditions that slog_b(x) be infinitely differentiable (actually only n−times differentiable) into Solve[], and got numbers that would CONVERGE for higher values of n. So we can now find the true value of e^^pi == x because we now know the true value of slog_e(x), and can solve that for when slog_e(x) == pi.
>
> I'm thinking of writing a paper about this, but I have no idea where I should submit it, any suggestions would be nice. But before I do, anyone interested can ask me at and_j_rob(at)yahoo(dot)com and I will try and send something to anyone interested in this numerical solution.
[snip]

Hi Andrew,

The good news is that such a solution is very interesting if indeed you've got it. Much more interesting that a simple continuous solution. The bad news is that an infinitely differentiable solution has already been constructed and what's worse, in that same paper the author proves that there are infinitely many infinitely differentiable solutions (as well as

infinitely many simply continuous solutions), in a paper which has already
been submitted for publication:

http://users.forthnet.gr/ath/jgal/math/ExtensionsPaper.html

Consequently, you still cannot talk about "the" value of, for example,
e^^pi, or things similar.
The really hard part, is finding a _real analytic_ solution, which, as far
as I know, has not been done yet analytically, but can certainly be done
numerically, using series approximations.

For some good attempts on the later, you can check out David Rusin's pages
[ref 29] on the above paper.

Cheerio,

> Andrew Robbins
−−
I. N. Galidakis
http://users.forthnet.gr/ath/jgal/
Eventually, _everything_ is understandable

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- ***Follow−Ups***:
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    - ◊ *From:* Andrew Robbins

- ***References***:
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    - ◊ *From:* Andrew Robbins

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