Re: Refute an alleged proof of the Riemann Hypothesis was Re: Refute a proof of the Riemann Hypothesis, round #4921

Source: http://sci.tech−archive.net/Archive/sci.math/2008−06/msg02109.html

---

- *From*: David C. Ullrich <dullrich@xxxxxxxxxxx>
- *Date*: Sat, 21 Jun 2008 04:52:11 −0500

On Fri, 20 Jun 2008 05:41:51 −0700 (PDT), gerry@xxxxxxxxxxxxxx wrote:

> On Jun 20, 9:38 pm, David C. Ullrich <dullr...@xxxxxxxxxxx> wrote:
>
>> On Wed, 18 Jun 2008 21:19:38 −0700 (PDT), mike3
>> <mike4...@xxxxxxxxx>
>> wrote:
>>
>>> On Jun 18, 7:52 pm, Gerry Myerson
>>> <ge...@xxxxxxxxxxxxxxxxxxxxxxxxx>
>>> wrote:
>>>
>>>> In article <erh6k.49$yg7.10@edtnps82>,
>>>> "Larry Hammick"
>>>> <larryhamm...@xxxxxxxxx> wrote:
>>>>
>>>>> One time in university
>>>>> calculus, a test required us
>>>>> to prove something about
>>>>> continuity. I used the letter
>>>>> epsilon where the textbooks
>>>>> conventionally use
>>>>> delta, and delta where they
>>>>> use epsilon. The advanced
>>>>> student who marked the
>>>>> paper gave me a zero on that
>>>>> question, apparently
>>>>> thinking that I had no
>>>>> idea what I was doing. The
>>>>> episode taught me lesson,

not about mathematics,
but about academia.

[...]

I think the lesson you learned, or ought to have learned, was not so much about academia as about how important conventions are as an aid to understanding.

Although I do think giving a "zero" on the question is too severe if that was his only error.

What error? If things are as he says there was no error at all, and he should get full credit. There's nothing incorrect about proving that f is continuous at 0 by saying

Suppose delta > 0. Let epsilon = _______. Assume that 0 < |x| < epsilon. Then _________, so that |f(x) − f(0)| < delta. QED.

It's a very bad idea to write the proof that way, of course, but there's nothing erroneous about it.

Well, let's take this to its logical conclusion and suppose he had submitted his homework in Bulgarian. The difference between taking the time and mental effort to translate from the Bulgarian to English and taking the time and effort to translate from unconventional English to conventional (mathematical) English is a difference of quantity, not quality. Either way, you're asking the marker, who is probably woefully underpaid and has her own life to get on with, to put extra effort into a thankless job. Writing in Bulgarian, swapping deltas & epsilons, they are both erroneous, if part of the purpose of the course (and, thus, the assignment) is to instill a little of the local mathematical culture.

This is more a wild extrapolation than a logical conclusion. There was an implicit requirement that the assignment be submitted in English. There's simply nothing incorrect about swapping "delta" and "epsilon", as long as it's done correctly. ("Done correctly": We don't know whether the required quantifiers were included. If not then of course the solution was wrong as written. But if the quantifiers _were_ included then the solution as written was much _better_ than what one often gets from students, where the letters have their traditional roles but the quantifiers are omitted.

I tend to suspect that the quantifiers were in fact omitted, since so many students omit them so often. If so then _that_ is in my opinion a valid reason for a 0 on the problem. In my class when students submit things using "epsilon" and "delta" in the traditional way but omitting the quantifiers they get a 0, with a note saying that I have no idea what they mean by "epsilon"...)

You omitted two points I made: (i) Swapping the letters this way _is_ a very bad idea (ii) Regardless, it's very important to realize that there's nothing sacred about the choice of letters.

For example, say we're proving that f o g is continuous at x if g is continuous at x and f is continuous at g(x) :

Suppose epsilon > 0. Choose delta_1>0
such that |f(x) − f(y)| < epsilon if |x − y| < delta_1.
(*) Now choose delta > 0 so that |f(y) − f(g(x))| < delta_1
if |y − g(x)| < delta. Etc.

In (*) it's important to realize that we _can_ substitute something other than "epsilon" in the definition of "f is continuous at". In my experience teaching this stuff students often do think there's something sacred about the choice of letters, and hence they're unable to come up with the proof of this utterly trivial fact.

And that means that they don't understand what the definition really means, which is a bad thing.
David C. Ullrich
.