

## Re: Wolfram Research QA process defect: Bug in Mathematica 6 – Integrate – 64 (Log, Cos, false convergence, multiple regression bug)

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*Source:* <http://sci.tech-archive.net/Archive/sci.math.symbolic/2008-01/msg00085.html>

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- *From:* Daniel Lichtblau <[danl@xxxxxxxxxxxx](mailto:danl@xxxxxxxxxxxx)>
  - *Date:* Sun, 27 Jan 2008 09:17:21 -0800 (PST)
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On Jan 27, 10:53 am, Vladimir Bondarenko <[v...@xxxxxxxxxxxxxxxx](mailto:v...@xxxxxxxxxxxxxxxx)> wrote:

On Jan 26, 7:46 am, David W. Cantrell <[DWCantrell...@xxxxxxxxxxxx](mailto:DWCantrell...@xxxxxxxxxxxx)> writes:

<http://groups.google.com/group/sci.math.symbolic/msg/f98fec141780152>

DWC>

DWC> [ NIntegrate/GenerateConditions ]

DWC>

DWC> Obviously, either I don't understand something

DWC> or the documentation is severely lacking.

Me, of the identical opinion... but our voices sounded like those in the commercial CAS wilderness...

But relax, there seem to be a hope?

Not of the sort I would think is needed (or, as we say, "I'm not that kind of a doctor").

Today, Daniel Lichtblau seems to be in a communicative mood:

<http://groups.google.com/group/sci.math.symbolic/msg/a7ef8d492ab18c3f>

I just haven't yet gotten around to more sensible pursuits.

So, David, maybe we together could ask him politely for an explanation both you and me (and maybe some other Wolfram Research customers) want to hear?

Cheers,

Vladimir  
[...]

Vladimir Bondarenko <v...@xxxxxxxxxxxxxxxxxxx> wrote:

[snip]

First, in 1996, Mathematica 3.0 returns a false result. For a divergent integral, it reports  $(-12 \text{ EulerGamma}^2 + \text{Pi}^2)/24$  which is 0.244645...

This bug persists in 2002, in Mathematica 4.2.

[...]

It's interesting to note that one can easily get version 6 to tell us that the integral does not converge. Just set an option:

```
Integrate[Log[z] (1 - Cos[z])/z, {z, 0, Infinity},  
GenerateConditions -> True]
```

yields

```
Integrate::idiv: Integral of Log[z]/z-(Cos[z] Log[z])/z does not converge  
on {0,Infinity}. >>
```

But I don't understand why that works! The documentation for GenerateConditions states "GenerateConditions is an option for Integrate that specifies whether explicit conditions on parameters should be

generated in the results of definite integrals." and "The default setting is `GenerateConditions->Automatic`, which is equivalent to a setting of `True` for one-dimensional integrals."

Is there a "parameter" involved? I don't see one.  
Is our integral not one-dimensional? We should have had `True` automatically.

Obviously, either I don't understand something or the documentation is severely lacking.

David– Hide quoted text –

– Show quoted text –

Clearly it was a bug, and not in the documentation. While convergence assessment is fraught with problems, documented behavior is indeed that an integral involving one dimension should not (well, almost never) change its behavior based on setting `GenerateConditions->True`.

As I mentioned in private email to David Cantrell, this appears to be fixed in the development kernel.

```
In[62]:= Integrate[Log[z]*(1 - Cos[z])/z, {z, 0, Infinity}]
```

During evaluation of In[62]:= Integrate::idiv: Integral of  $\text{Log}[z]/z - (\text{Cos}[z] \text{Log}[z])/z$  does not converge on  $\{0, \text{Infinity}\}$ .

```
Out[63] Integrate[((1 - Cos[z])*Log[z])/z, {z, 0, Infinity}]
```

Daniel Lichtblau  
Wolfram Research