

# Definite integration question

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*Source:* <http://sci.tech-archive.net/Archive/sci.math/2007-08/msg01512.html>

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  - *Date:* 09 Aug 2007 21:01:50 +0100 (BST)
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This isn't a homework problem, but something I've been puzzled by for a while.

I'm trying to find an analytic form of the surface integral:

$$\int_S (1 + h \cos(\phi))^{-1} dh d\phi$$

over the circle  $h=0$  to  $h_0$ ,  $\phi=0$  to  $2\pi$ . The one bit of information I don't know how to represent is that  $l > h$ . There's a pole in the system at  $l = \pm h$ , so perhaps I need to include this somehow.

Doing this numerically works, and it converges.

My textbook suggests the substitution  $g = \tan(0.5x)$ , but evaluating this returns the answer:

[insert subs result]

which evaluates to zero. It's not as if we're introducing a pole at  $g = \tan(\pi)$  since the integral will still evaluate.

[look at wikipedia closed form]

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