Re: How Do I Invert These Two Functions

Source: http://sci.tech−archive.net/Archive/sci.math/2007−11/msg05976.html

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* *From*: quasi <quasi@xxxxxxxx>
* *Date*: Wed, 28 Nov 2007 19:08:33 −0500

On Wed, 28 Nov 2007 18:47:41 −0500, quasi <quasi@xxxxxxxx> wrote:

> On Wed, 28 Nov 2007 18:35:14 −0500, quasi <quasi@xxxxxxxx> wrote:
>
>> On Wed, 28 Nov 2007 23:23:02 GMT, John Schutkeker
>> <jschutkeker@xxxxxxxxxxxxxxxxxxxx> wrote:
>>
>>> If I define u1(r1,r2)=(1/r1)+(1/r2) and u2(r1,r2)=1/(r2−r1).
>>> How would I
>>> go about solving these two equations for r1(u1,u2) and
>>> r2(u1,u2), which
>>> would constitute "inverting the functions"? Thanks In
>>> Advance!
>>
>> Elementary algebra! Try it before giving up.
>>
>> Write down 2 equations:
>>
>> u1 = (1/r1)+(1/r2)
>>
>> u2 = 1/(r2−r1)
>>
>> Viewing r1,r2 as the unknowns, you have 2 equations in 2 unknowns.
>>
>> How hard can it be?
>>
>> Of course, there are always tricks, but before looking for tricks, how
>> about trying the most basic method (from elementary algebra):
>>
>> Choose one equation and solve that equation for one of the unknowns in
>> terms of the other. Then use the result as a replacement for that
>> unknown in the other equation, thus yielding one equation in one
>> unknown. You should be able to figure out the rest.

> You try it.

> Also, for a function to be invertible, it has to be one−to−one. But as you'll see when you solve algebraically, your function is mostly two−to−one (on R^2).

Looking more closely at your original question, I should point out that the title of your thread is not accurate.

You are not inverting _two_ functions.

Instead you are (locally) inverting a single function with 2 component functions.

You can regard the map

(r1,r2) −−> (u1,u2)

defined by the equations

u1 = (1/r1)+(1/r2)

u2 = 1/(r2−r1)

as a map from R^2 to R^2.

Call it u. Thus u has 2 components functions, u = (u1,u2).

So you can talk about inverting u, but you are _not_ inverting the functions u1,u2. Of course, as mentioned, u is not one−to−one, so u doesn't really have an inverse (except locally). But you can still solve for algebraically for (r1,r2) in terms of (u1,u2), and as you'll see, for most (but not all) pairs (u1,u2), there are 2 inverse images.

quasi
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