Re: Positive/Negative after taking the square root

Source: http://sci.tech−archive.net/Archive/sci.math/2007−11/msg05977.html

---

- *From*: matt271829−news@xxxxxxxxxxx
- *Date*: Wed, 28 Nov 2007 16:06:11 −0800 (PST)

On Nov 28, 7:36 am, Taras_96 <taras...@xxxxxxxxx> wrote:

> I'm not totally mathematically inept, but I find I'm getting confused
> by the following:
>
> I'm confused as to what happens to the +/− in the following examples:
>
> As a simple example, integrate x^2
>
> int{x^2 dx}
>
> Let x^2 = u, then dx = du/(2x) and du = 2x, dx = +/− 2sqrt{u}
>
> Then the integral becomes
> =int{u/(+/−)2sqrt{u} du}
> = +/− int{1/2sqrt{u} du}
> = +/− 1/3u^1.5
> = +/ 1/3x^3 (substitute back in for u)
>
> This is obviously not correct, and the correct answer is in taking
> only the positive square root when representing dx interms of u and
> du. However, is there a mathematical/logical reason for discounting
> the negative root? After all, if y^2 = x, then y = +/−sqrt{x}

When you substitute u = x^2 you're losing information about which of the two possible values of x you're dealing with. (This always happens when the inverse function is multi−valued.) Strictly speaking you need to keep track of the separate cases, so that everything is uniquely defined, and then it all should come right:

If x > 0 then u = x^2 implies sqrt(u) = x, dx = du/(2*sqrt(u)) and we end up with Int x^2 dx = 1/3*u^(3/2). Since what we know is that sqrt(u) = x (not just that u = x^2), when re−substituting we should write 1/3*u^(3/2) in terms of sqrt(u), giving 1/3*u^(3/2) = 1/3*sqrt(u)^3 = 1/3*x^3.

If x < 0 then u = x^2 implies sqrt(u) = −x, dx = −du/(2*sqrt(u)), and we end up with Int x^2 dx = −1/3*u^(3/2). Now we have −1/3*u^(3/2) =

−1/3*sqrt(u)^3 = −1/3*(−x)^3 = +1/3*x^3, as before.

.