Subject: Re: plot dirac delta function?
Posted by swingnut on Sun, 30 Jul 2006 05:27:28 GMT
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kuyper@wizard.net wrote:
> swingnut@gmail.com wrote:
>> FYI, while the definition can be approached a number of equivalent
>> ways, the value of the Dirac IS "well-defined" at delta(x).
>> Technically, it's "well-defined" at the value such that its argument is
>> zero (which here is x=0).
>>
>> The value is indeed infinity. At least, that's how it's used in
>> physics.
>
> No, it is not. I'm very well versed in the use of the dirac delta
> function in physics, and the value of delta(0) is never used in any
> meaningful sense. Any equation which attempts to make use of the value
> at zero is meaningless. The dirac delta function only becomes
> meaningful after you've integrated over it.

FYI: the physical meaning of delta is used ALL the damn time when you're talking about the spatial distribution of point particles (think electrons and other extensionless subatomic particles here). If the particle has no extension, as is generally believed to be true for, e.g. electrons due to quantum considerations (classical radius of the electron and arguments like that), then the only way to describe a mass distribution is by summing up a bunch of things that are zero except for at a single point in "configuration space" with no physical extension. Following the logic, in any phase space, when the object's parameters are point values in that space, you get the same behavior for those parameters: a Dirac for the object's state. To say that delta(x-a) just means that the particle is at x=a in that phase space; x=0 refers to the origin of the phase space. These things are used all the time or underly other calculations that are used all the time. If you are using statistical mechanics at all, you should be seeing this regularly.

Another physical application is as the Green's function corresponding to Guass's law for a point charge, the mathematics of which gets quickly generalized for minimum variance packet in quantum mech. The fun just never stops.