Subject: Re: plot dirac delta function?
Posted by James Kuyper on Sun, 30 Jul 2006 14:32:36 GMT
View Forum Message <> Reply to Message

swingnut@gmail.com wrote:
> kuyper@wizard.net wrote:
...
>> 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

I was not referring to the physical meaning of delta, which is that it represents a point source. I was referring specifically to the actual value of the Dirac delta function at 0; any equation that involves evaluating that function at that point, rather than integrating over it, to calculate a physically meaningful quantity is an error.

> 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,

Yes, it's considered quite likely that quarks and leptons are true point particles, which means that their physical extent is accurately described by a dirac delta function. However, any physically meaningful quantity you can calculate is not directly related to the value of that function at its center, but is instead calcuated directly or indirectlly from an integral over that function.

> 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.

I haven't done any statistical mechanics in more than a decde, but when I was studying it, we used dirac delta functions all over the place. It's a very useful concept, and I've never denied that fact. But we

never used the value of that fucntion at zero for any meaningful
purpose. It only became meaningful after integration.

> 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.

Again, that's an example where a Dirac delta function is a very useful
tool - but only inside an integral, which is how Green's functions are
always used. It's meaningless without the integral.
