Subject: Re: plot dirac delta function?
Posted by Benjamin Hornberger on Wed, 19 Jul 2006 16:28:56 GMT
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kuyper@wizard.net wrote:
>
> The Dirac delta function is defined by the following equations:
>
> delta(x) = 0 if x ne 0
>
> integral of delta(x) dx from x0 to x1 = 1, if x0 < 0 and x1 > 0
>
> Notice that this definition fails to identify explicitly the value of
> delta(0). That's because there's no meaningful value that can be
> assigned to delta(0). The best you can do is to call it infinity, but
> even that's not quite right, for reasons that I don't remember right
> now.

I think that (the last paragraph) applies to the continuous case. In the discrete case, it follows quite clearly from the two equations above that the delta function must be an array which is 1 for the center (more on that below) and zero otherwise. Two examples:

1. Convolution of a function (array) with a delta function must reproduce the function (or shift if the delta function is not centered). This is clearly fulfilled by an array which has a 1 in one element and zeroes otherwise.

2. The Fourier Transform of a (centered) delta function is a constant. The value of the constant depends somewhat on the definition of the FT (in IDL, the forward FFT of a delta function as defined above is a constant 1/N, N being the number of array elements, and the reverse FFT is a constant 1).

You have to keep in mind that for frequency analysis, IDL assumes the zero frequency ("center") to be at the zero element in real AND Fourier space. I, like many others, prefer to shift all arrays by minus/plus N/2 before and after an FT and work on "centered" arrays, which makes the plots look more intuitive.