Fourier_Series_Square.m

```
4  pkg load signal;
5
6  %n is a constant
7  function retval = sinn_An(n,x)
8    An = 1.5/pi/n; #one period
9    retval = An*sin(n.*x);
10 endfunction
11
12 %The full series
13 function retval = fourier_square(n,x)
14   retval = .5;
15   for i=[1:n]
16     retval = retval+sinn_An(i,x);
17   endfor
18 endfunction
19
20 x = 0.0:0.001:(2.0*pi)*10; %Octave is awesome!!
21
22
23 S1 = fourier_square(1,x);
24
25 plot(x,S1,'color','black','linewidth',3);
26 hold on;
27 grid on;
28 axis([-1 11 -0.5 1.5]);
29 xlabel("x");
30 ylabel("Amplitude")
31 plot(x,sin(x)*.5+.5,'color','red','linewidth',3);
32
```

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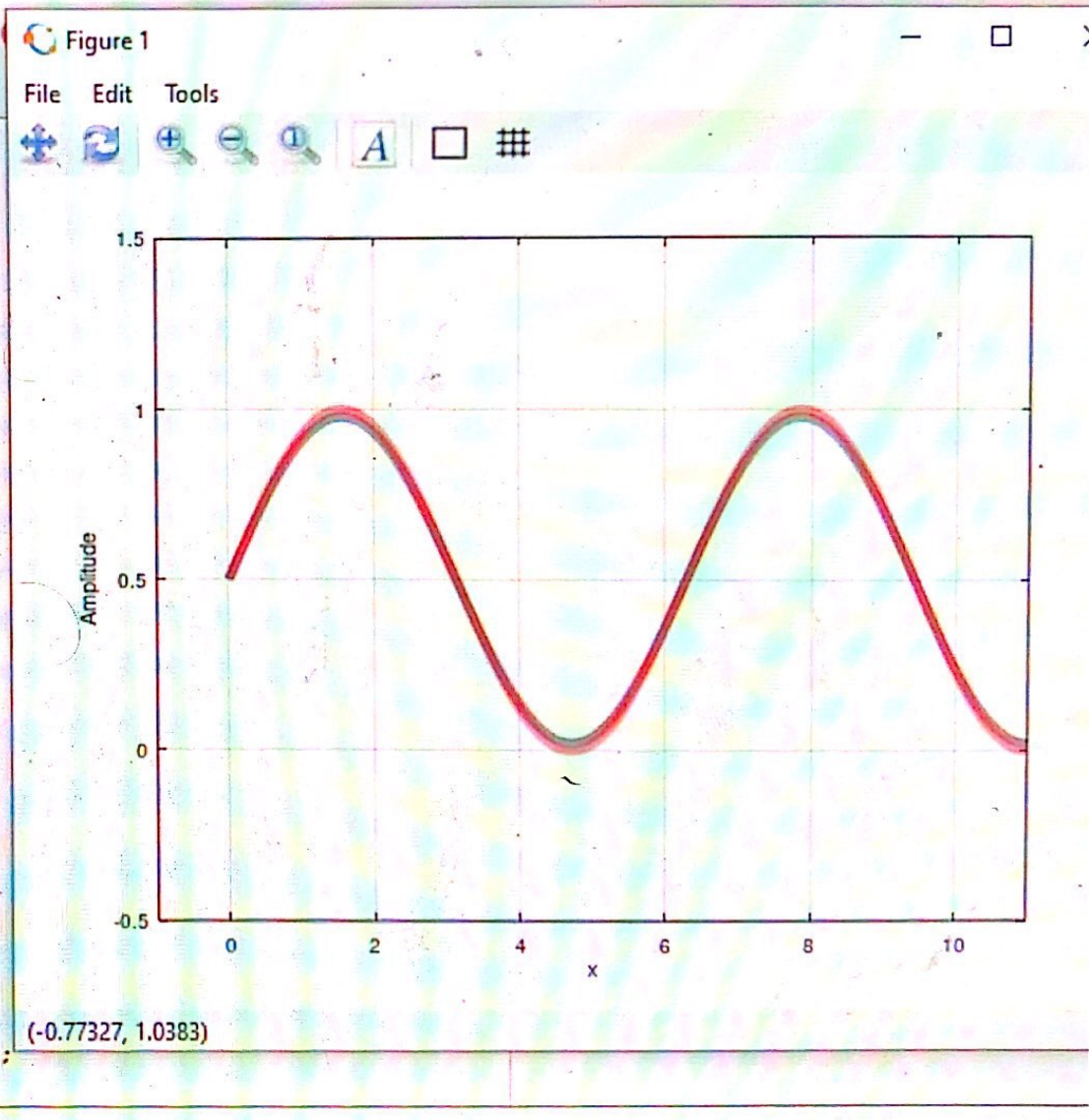

dirac delta function

$$f(x) = \begin{cases} t = t_0, = a \\ t \neq t_0, = 0 \end{cases}$$

by def $F\{f(x)\} = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} f(x) e^{-i\omega x} dx$

$$= \frac{1}{\sqrt{2\pi}} \left[\int_{-\infty}^{t} 0 e^{-i\omega x} dx + \int_{t}^{t_0} a e^{-i\omega x} \int_{t_0}^{\infty} 0 e^{-i\omega x} \right.$$

$$= \frac{1}{\sqrt{2\pi}} \int_{t}^{t_0} a e^{-i\omega x} dx$$

$$= \frac{1}{\sqrt{2\pi}} \left[\frac{a e^{-i\omega x}}{-i\omega} \right|_{t}^{t_0}$$

$$= \frac{1}{\sqrt{2\pi}} \left[\frac{a e^{-i\omega t}}{-i\omega} - \frac{a e^{-i\omega t_0}}{-i\omega} \right]$$

$$= \frac{1}{\sqrt{2\pi}} \left[\frac{a\left(e^{-2(i\omega) t + t_0} \right)}{-i\omega} \right]$$

$$|f(x)|^2 = \frac{1}{2\pi} \left[\frac{a^2 e^{-4(iw)2(t+t_0)}}{w} \right]$$

$$\text{phase } \phi = \frac{b_n}{a_n} = \frac{a e^{-2(iw)(t+t_0)}}{\sqrt{2\pi}} = \text{undefined}$$