Scilab Manual for Principles of Communication by Prof Monali Chaudhari Electronics Engineering VESIT[1]

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Experiment: 1

To plot the magnitude and phase response of continuous time signal

Scilab code Solution 1.1 To plot the magnitude and phase response of continuous time signal

```
1  //To plot the magnitude and phase response of
       continuous time signal
2  //scilab 5.4.1;64 bit(windows 8)
3  stacksize max
4  clc; clear;close;
5  A =1; // Amplitude
6  Dt = 0.005;
7  t = 0: Dt :10;
8  xt = exp(-A*t);
9  // Continuous time Fourier Transform
10 Wmax =2*%pi*1; // Analog Frequency = 1Hz
11 K = 4;
12 k = 0:(K/1000):K;
13 W = k* Wmax /K;
14 XW = xt*exp(-sqrt(-1)*t'*W)*Dt
15 XW_Mag =abs(XW);
```

```
16 W = [-mtlb_fliplr(W),W(2:1001)]; // Omega from -Wmax
       to Wmax
17 XW_Mag=[mtlb_fliplr(XW_Mag ),XW_Mag(2:1001)];
18 [XW_Phase ,db] = phasemag (XW);
19 XW_Phase = [-mtlb_fliplr( XW_Phase ),XW_Phase
      (2:1001)];
20 // Plotting Continuous Time Signal
21 subplot(3,1,1)
22 a=gca();
23 a.y_location = "origin";
24 plot2d(t,xt);
25 xlabel( 't in sec .');
26 ylabel(' x(t) ')
27 title(' Continuous Time Signal ' )
28
29 // Plotting Magnitude Response of CTS
30 subplot (3 ,1 ,2);
31 a = gca ();
32 a.y_location = "origin";
33 plot2d(W, XW_Mag,style=5 );
34 xlabel ( ' Frequency in Radians / Seconds--> W' );
35 ylabel ( ' abs (X(jW) ) ' )
36 title ( 'Magnitude Response (CTFT) ' )
37 // Plotting Phase Reponse of CTS
38 subplot (3 ,1 ,3);
39 a =gca();
40 a.y_location="origin";
41 a.x_location="origin";
42 plot2d(W, XW_Phase *%pi/180,style=3);
43 xlabel(' Frequency in Radians / Seconds--> W');
44 ylabel('<X(jW) ')
45 title(' Phase Response (CTFT)in Radians' )
46 mprintf('|F(w)|= 1/sqrt(a^2+w^2) and\n Theta(w)=-
      atan(w/a)')
```

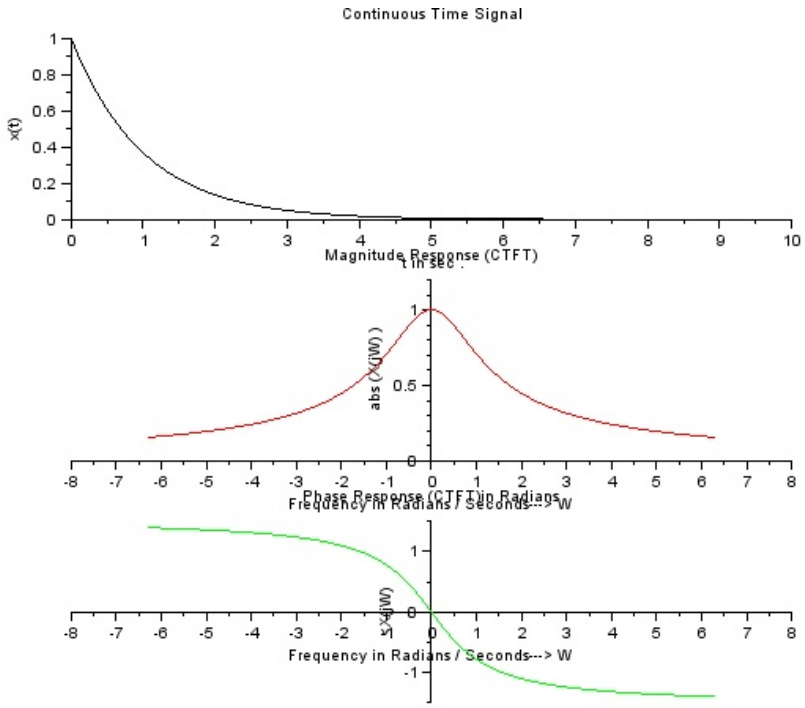

Figure 1.1: To plot the magnitude and phase response of continuous time signal

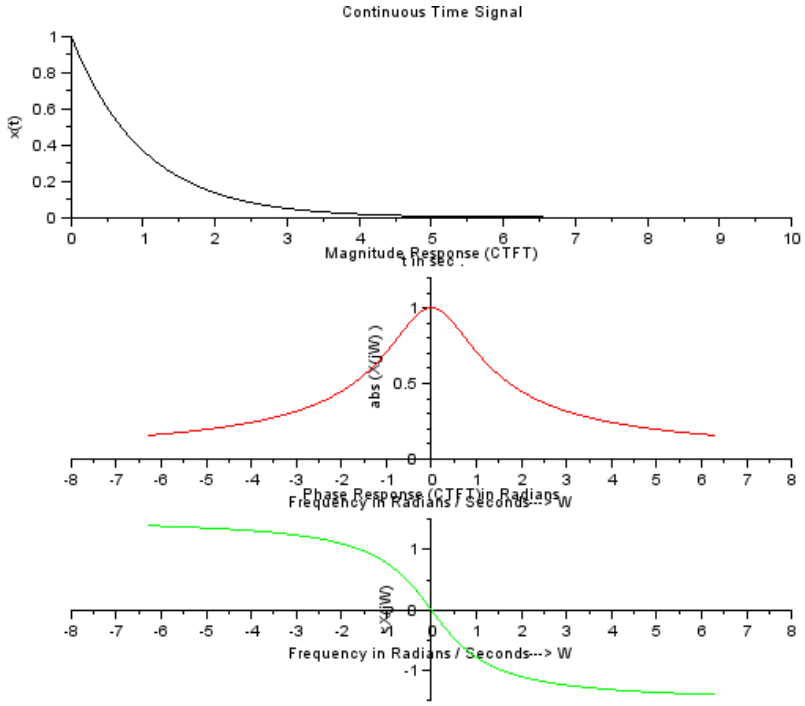

Figure 1.2: To plot the magnitude and phase response of continuous time signal

Experiment: 2

To plot Amplitude Modulated wave and its frequency spectrum

Scilab code Solution 2.1 To plot Amplitude Modulated wave and its frequency spectrum

```
1  //To plot Amplitude Modulated wave and its frequency
       spectrum
2  //scilab 5.4.1;64 bit(windows 8)
3  clf();
4  clc
5  deff("[y]=f(x)","y=Ec*(1+ma*(sin(wm*x)))*sin(wc*x)")
6  Ec=10,ma=0.5,wm=10000*%pi,wc=2*%pi*1e7
7  x=[0:0.01:20]*%pi/10;
8  subplot(2,1,1)
9  fplot2d(x,f)
10 xlabel("t", "fontsize", 3);
11 ylabel("Modulated Wave", "fontsize", 3, "color", "
```

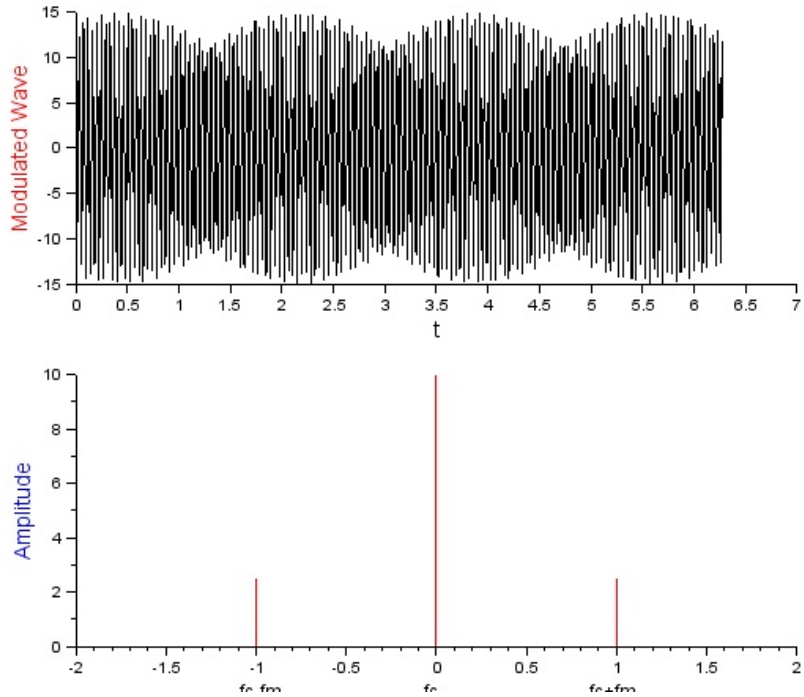

Figure 2.1: To plot Amplitude Modulated wave and its frequency spectrum

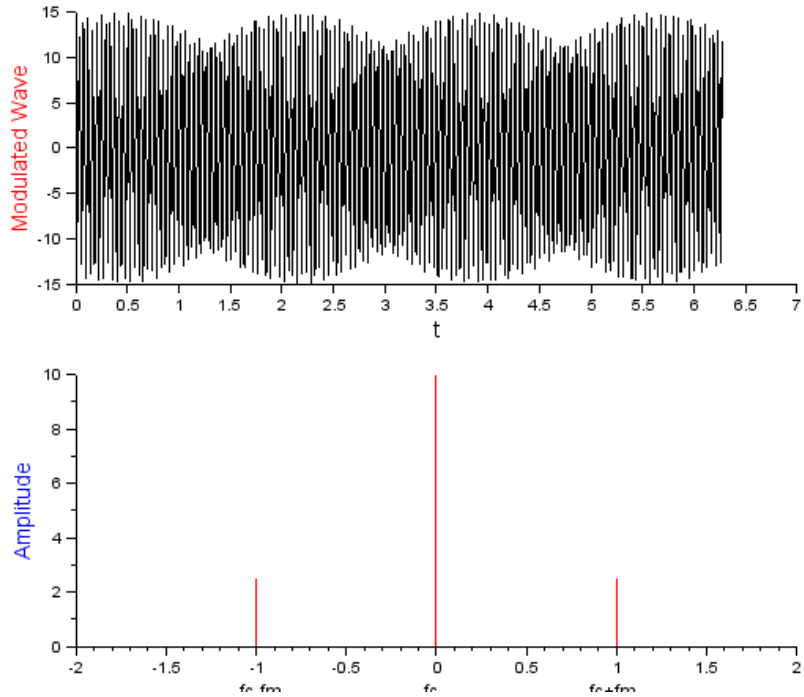

Figure 2.2: To plot Amplitude Modulated wave and its frequency spectrum

```
    red");
12  Fc=wc/(2*%pi)
13  Fm=wm/(2*%pi)
14  Fusb=(wm+wc)/(2*%pi)
15  Flsb=(wm-wc)/(2*%pi)
16  mprintf('USB freq=%d k5Hz\nUSB amplitude=%f V\nLSB
        freq=%d kHz\nLSB amplitude=%f V\nCarrier
        amplitude=%d V',Fusb*1e-3,2.5,Flsb*-1e-3,2.5,10)
17  F=[0,2.5,10,2.5,0]
18  T=[-2,-1,0,1,2]
19  subplot(2,1,2)
20  plot2d3(T,F,5)
21  xlabel("Freq", "fontsize", 3);
22  ylabel("Amplitude", "fontsize", 3, "color", "blue");
23  xlabel("fc-fm                                    fc
                                        fc+fm", "fontsize"
    , 2);
```

Experiment: 3

To represent a function in exponential Fourier series

Scilab code Solution 3.1 To represent a function in exponential Fourier series

```
1 //To represent a function in exponential Fourier
     series
2 //scilab 5.4.1;64 bit(windows 8)
3 clc
4 close
5 clear
6 V=1
7 t0=1,T=1,w0=2*3.14/T,P=1
8 t=0:0.01:3
9 f=V*abs(sin(%pi*t))
10 //The Expo fourier series coeff
11 disp('The Expo fourier series coeff are: for n=-5 to
     5')
12 a=1
```

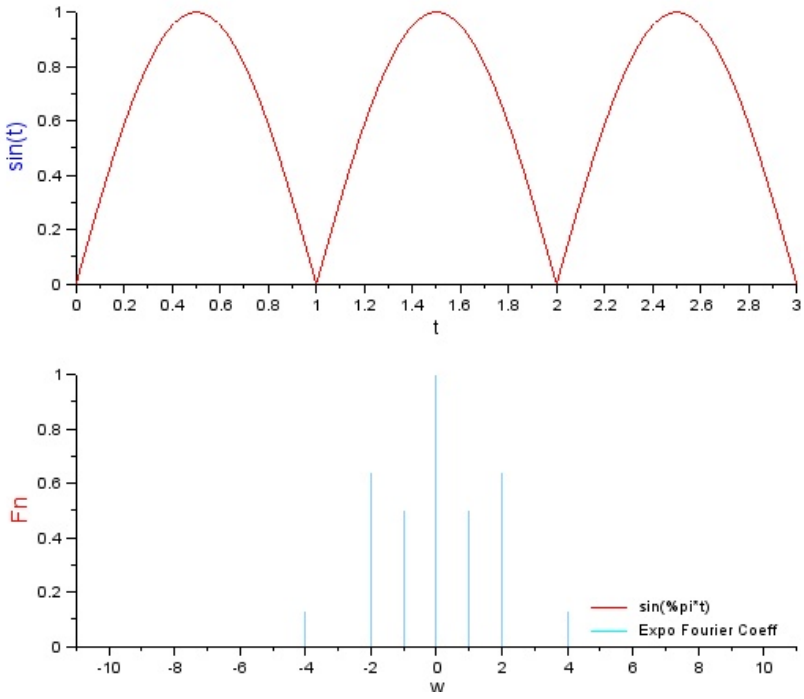

Figure 3.1: To represent a function in exponential Fourier series

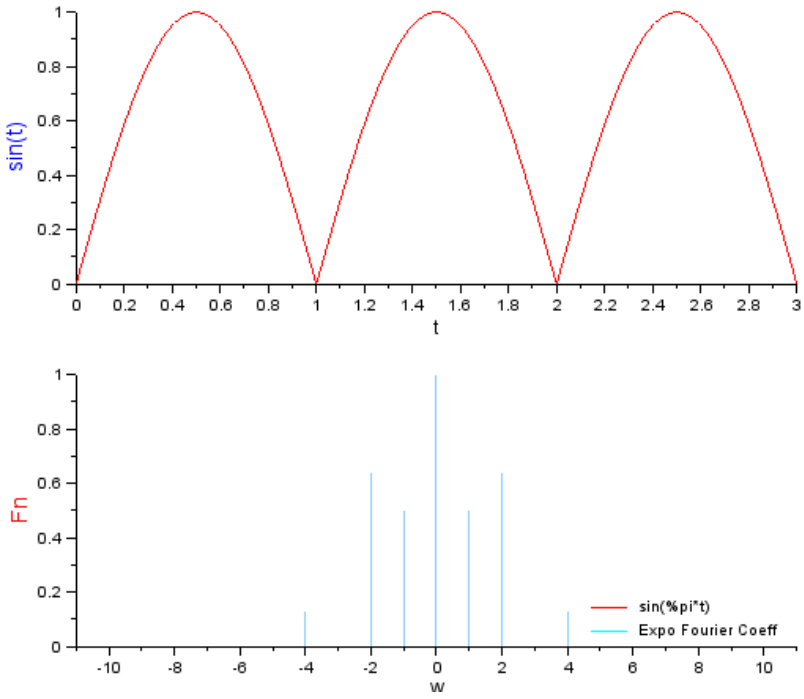

Figure 3.2: To represent a function in exponential Fourier series

```
13 for n=-5:5
14     fr=f.*cos(%pi*n*t/T)
15     Fr(a)=inttrap(t,fr)
16     fi=f.*sin(%pi*n*t/T)
17     Fi(a)=inttrap(t,fi)
18
19     mag(a)=abs(Fr(a)+%i*Fi(a))
20
21     disp(Fr(a)-(%i*Fi(a)))
22     x(1 ,size(t,2))=0
23     x=x+((Fr(a))-%i*Fi(a)).*(cos(%pi*n*t/T)+%i*sin(
          %pi*n*t/T))
24     a=a+1
25 end
26 mprintf('The given function in Expo Fourier series
     can be represented as \n')
27 mprintf('f(t)= 2V/pi -2V*exp(j2*pi*t)/3*pi -2V*exp(
     j2*pi*t)/15*pi\n       -2V*exp(j2*pi*t)/35*pi ...\
     n      -2V*exp(-j2*pi*t)/3*pi -2V*exp(-j2*pi*t)
     /15*pi ...')
28 n=-5:5
29 subplot(2,1,1),plot2d(t,f,style=5)// Rectified sine
     function Plot
30 xlabel("t", "fontsize", 2);
31 ylabel("sin(t)", "fontsize", 3, "color", "blue");
32 subplot(2,1,2),plot2d3(n,mag,12,rect=[-11,0,11,1],
     style=4)//Plot of the magnitude of the Fourier
     coeff
33 xlabel("w", "fontsize", 2);
34 ylabel("Fn", "fontsize", 3, "color", "red");
35 legends(["sin(%pi*t)";"Expo Fourier Coeff"],[5,4],
     with_box=%f, opt="lr" )
```

Experiment: 4

To plot continuous time fourier transorm of a continuous time signal

Scilab code Solution 4.1 To plot continuous time fourier transorm of a continuous time signal

```
1 //To plot continuous time fourier transorm of a
     continuous time signal
2 //scilab 5.4.1;64 bit(windows 8)
3 clc;
4 clear;
5 A=1;// Amplitude
6 Dt=0.005;
7 t1=-4.5:Dt:4.5;
8 xt1=exp(-A*abs(t1));
9 // Continuous time Fourier Transform
10 Wmax1 =2*%pi*1;// Analog Frequency = 1Hz
11 K=4;
```

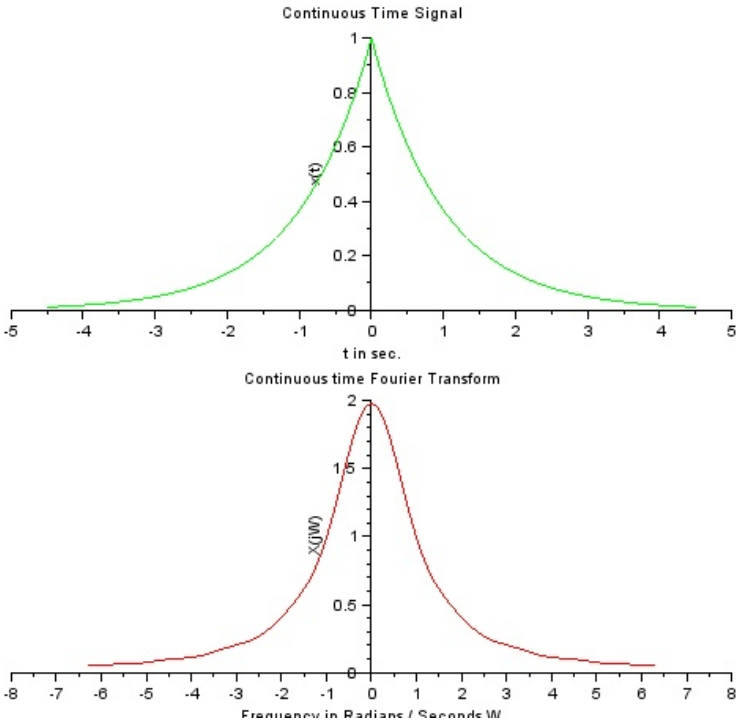

Figure 4.1: To plot continuous time fourier transorm of a continuous time signal

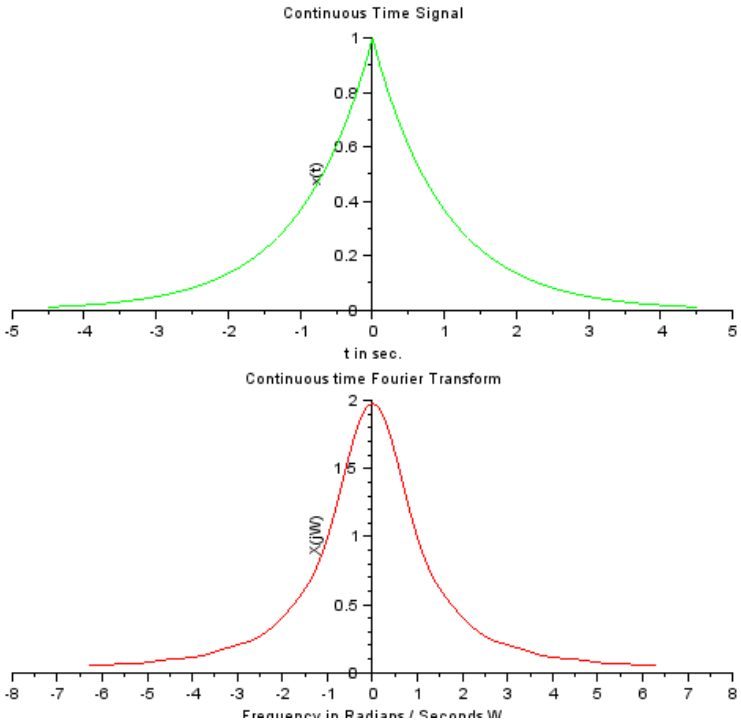

Figure 4.2: To plot continuous time fourier transorm of a continuous time signal

```
12 k=0:(K/1000):K;
13 W1=k*Wmax1/K;
14 XW1=xt1*exp(-sqrt(-1)*t1'*W1)*Dt;
15 XW1=real(XW1);
16 W1=[-mtlb_fliplr(W1), W1(2:1001) ]; // Omega from -
      Wmax to Wmax
17 XW1=[ mtlb_fliplr(XW1), XW1(2:1001) ];
18 subplot(2 ,1 ,1);
19 b=gca();
20 b.y_location = "origin";
21 plot2d(t1,xt1,3);
22 xlabel('t in sec.');
23 ylabel('x(t)')
24 title(' Continuous Time Signal')
25 subplot(2 ,1 ,2);
26 b =gca();
27 b.y_location = "origin";
28 plot2d(W1,XW1,5);
29 xlabel('Frequency in Radians / Seconds W');
30 ylabel('X(jW)')
31 title('Continuous time Fourier Transform ')
32 mprintf('|F(w)|= 2*a/sqrt(a^2+w^2) and\n Theta(w)=0'
      )
```

Experiment: 5

To plot continuous time fourier transform of a constant

Scilab code Solution 5.1 To plot continuous time fourier transform of a constant

```
1 //To plot continuous time fourier transform of a
     constant
2 //scilab 5.4.1;64 bit(windows 8)
3 clc
4 clear ;
5 close ;
6 // CTS Signal
7 A=2;// Amplitude
8 Dt=0.01;
9 T1=49.5; //Time in seconds
10 t=-T1/2: Dt:T1 /2;
11 for i=1:length(t)
12 xt(i)= A;
13 end
```

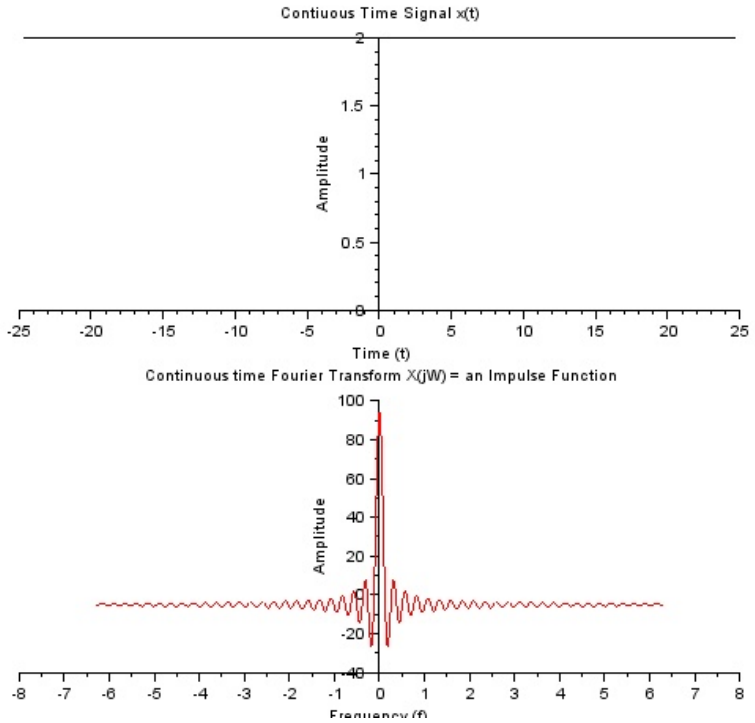

Figure 5.1: To plot continuous time fourier transform of a constant

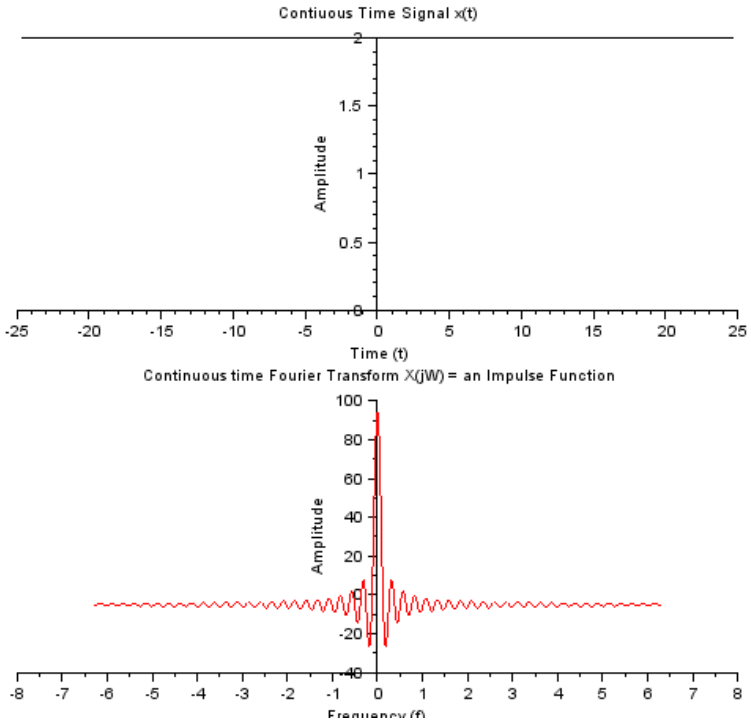

Figure 5.2: To plot continuous time fourier transform of a constant

```
14 // Continuous time Fourier Transform
15 Wmax=2*%pi*1;// Analog Frequency = 1Hz
16 K =4;
17 k=0:(K/1000):K;
18 W=k*Wmax/K;
19 xt=xt';
20 XW =(xt*exp(-sqrt(-1)*t'*W)*Dt)-5;
21 XW_Mag =real(XW);
22 W =[-mtlb_fliplr(W), W(2:1001)]; // Omega from -Wmax
       to Wmax
23 XW_Mag =[mtlb_fliplr( XW_Mag ), XW_Mag(2:1001)];
24 subplot(2 ,1 ,1);
25 a =gca();
26 a.data_bounds =[ -4 ,0;4 ,2];
27 a.y_location ="origin";
28 plot2d(t,xt);
29 xlabel('Time (t)');
30 ylabel('Amplitude')
31 title(' Contiuous Time Signal x(t) ')
32 subplot(2 ,1 ,2);
33 a=gca();
34 a.y_location ="origin";
35 plot2d(W,XW_Mag,5);
36 xlabel('Frequency (f)');
37 ylabel('Amplitude')
38 title('Continuous time Fourier Transform X(jW) = an
     Impulse Function' )
39 mprintf('|F(w)|= 2*pi*A*delta(w), Hence the Fourier
     Transform of constant is an Impulse Function')
```