Practical 1

A]

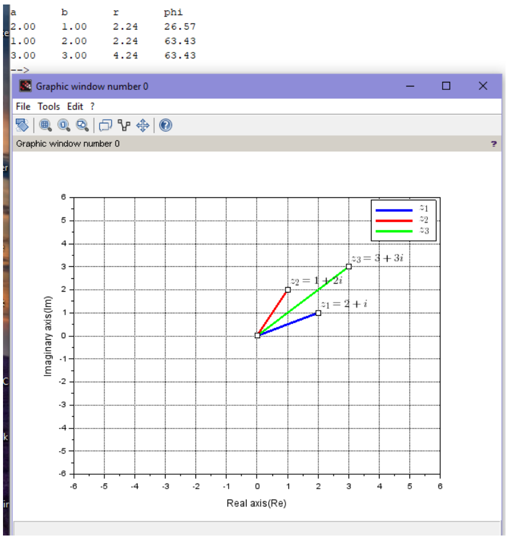
```
clc()
//define complex number
a1=2;
b1=1;
a2=1;
b2=2;
z1=complex(a1,b1);
z2=complex(a2,b2);
//Mathematical operation
z3=z1+z2; //z3=z1-z2,z3=z1*z2,z3=z2/z3//
a3=real(z3);
b3=imag(z3);
//plot
figure(0)
clf()
hf=gcf()
hf.background=-2
ha=gca()
ha.data_bounds=[-5,-5;5,5];
xgrid();
plot([0 a1],[0 b1],'b','LineWidth',3)
plot([0 a2],[0 b2],'r','LineWidth',3)
plot([0 a3],[0 b3],'g','LineWidth',3)
xlabel('Real axis(Re)','FontSize',2)
ylabel('Imaginary axis(Im)','FontSize',2)
legend('$\Large {z_{1}}$','$\Large {z_{2}}$','$\Large {z_{3}}$')
plot(0,0,'sk')
plot(a1,b1,'sk')
plot(a2,b2,'sk')
plot(a3,b3,'sk')
xstring(a1,b1,'$\Large{z_{1}=2+i}$')
xstring(a2,b2,'$\Large{z_{2}=1+2i}$')
xstring(a3,b3,'$\Large{z_{3}=3+3i}$')

//calculate exp form
r1=sqrt(a1^2+b1^2);
r2=sqrt(a2^2+b2^2);
r3=sqrt(a3^2+b3^2);
phi1=atan(b1/a1)*180/%pi;
phi2=atan(b2/a2)*180/%pi;
phi3=atan(b3/a3)*180/%pi;

//Display polynomial and polar parameters
mprintf('%s\t%s\t%s\t%s\n','a','b','r','phi')
mprintf('%4.2f\t%4.2f\t%4.2f\t%4.2f\n',a1,b1,r1,phi1)
mprintf('%4.2f\t%4.2f\t%4.2f\t%4.2f\n',a2,b2,r2,phi2)
mprintf('%4.2f\t%4.2f\t%4.2f\t%4.2f',a3,b3,r3,phi2)
```

B]

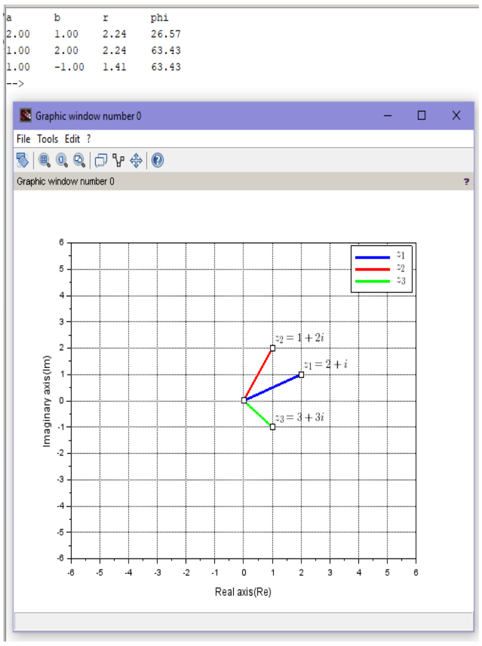
```
clc();
a1=1;b1=2;
a2=1;b2=-1;
a3=1;b3=2;
a4=1;b4=1;
z1=complex(a1,b1);
z2=complex(a2,b2);
z3=complex(a3,b3);
z4=complex(a4,b4);
```

```
n1=2;
n2=1;
n3=-1;
n4=1;
z11=z1^n1;
z22=z2^n2;
z33=z3^n3;
z44=z4^n4;
z=(z11*z22)/(z33*z44);
disp(z11);
disp(z22);
disp(z33);
disp(z44);
disp(z);
a=real(z);
b=imag(z);
r1=sqrt(a1^2+b1^2);
r2=sqrt(a2^2+b2^2);
r3=sqrt(a3^2+b3^2);
r4=sqrt(a4^2+b4^2);
r=sqrt(a^2+b^2);
phi1=atan(b1/a1);
phi2=atan(b2/a2);
phi3=atan(b3/a3);
phi4=atan(b4/a4);
phi=atan(b/a)
r11=r1^n1
r22=r2^n2
r33=r3^n3
r44=r4^n4
phi11=phi1*n1
phi22=phi2*n2
phi33=phi3*n3
phi44=phi4*n4
p11=r11*(cos(phi11)+%i*sin(phi11))
p22=r22*(cos(phi22)+%i*sin(phi22))
p33=r33*(cos(phi33)+%i*sin(phi33))
p44=r44*(cos(phi44)+%i*sin(phi44))
p=(p11*p22)/(p33/p44);
disp(p)
mprintf('%s\t%s\t%s\t%s\n','a','b','r','phi')
mprintf('%4.2f\t%4.2f\t%4.2f\t%4.2f\n',a1,b1,r1,phi1)
mprintf('%4.2f\t%4.2f\t%4.2f\t%4.2f\n',a2,b2,r2,phi2)
mprintf('%4.2f\t%4.2f\t%4.2f\t%4.2f\n',a3,b3,r3,phi3)
mprintf('%4.2f\t%4.2f\t%4.2f\t%4.2f\n',a4,b4,r4,phi4)
mprintf('%4.2f\t%4.2f\t%4.2f\t%4.2f\n',a,b,r,phi);
```

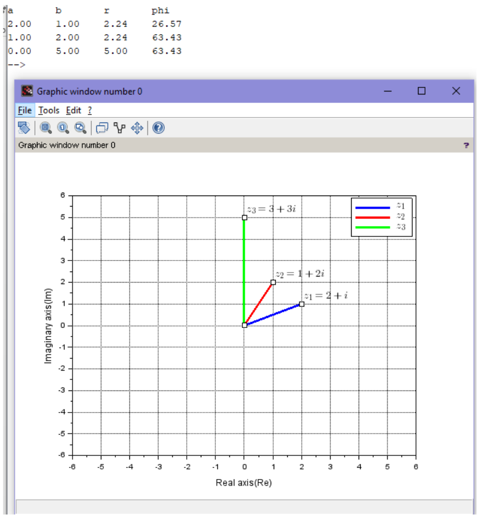
Addition output:



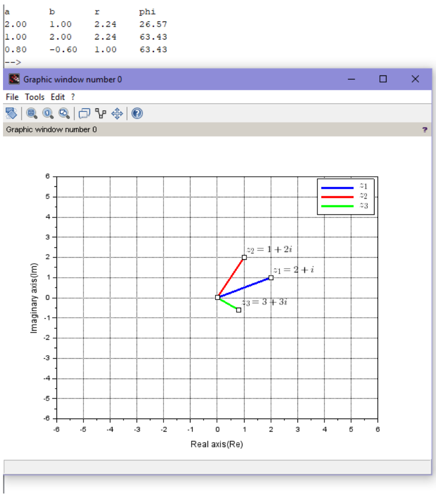
Subtraction output:



Multiplication output:



Division output:



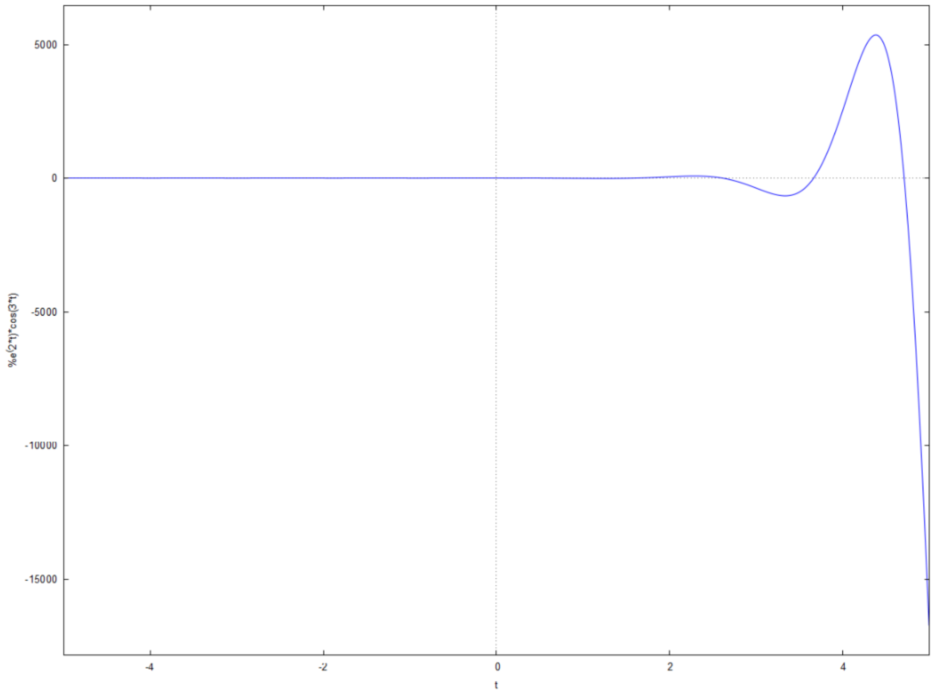
Practical1b:

```
-3. + 4.i

 1. - i

 0.2 - 0.4i

 1. + i

-2. + 11.i

-22. - 4.i
a        b        r        phi
1.00     2.00     2.24     1.11
1.00     -1.00    1.41     -0.79
1.00     2.00     2.24     1.11
1.00     1.00     1.41     0.79
-2.00    11.00    11.18    -1.39

-->
```

Practical 2A

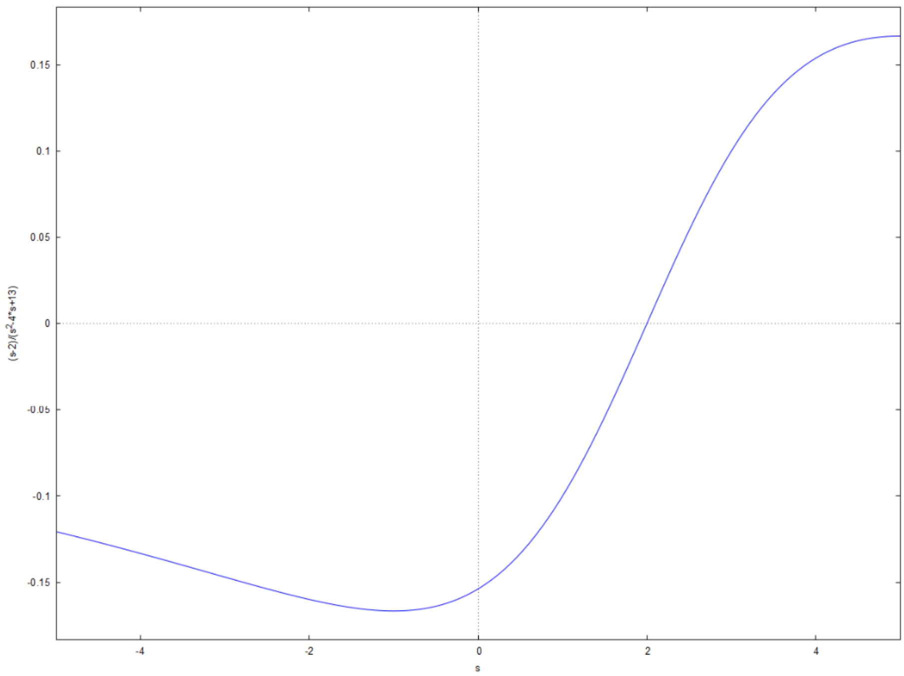
Laplace Transform

a) e^(2t) cos3t:

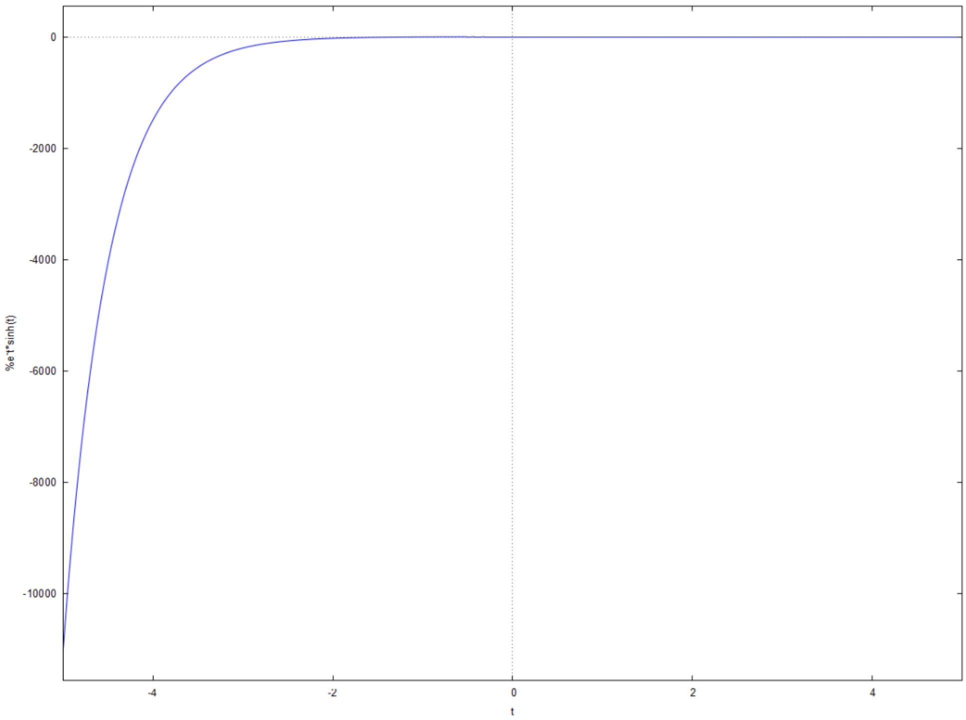


Laplace:

$$\frac{s-2}{s^2-4s+13}$$

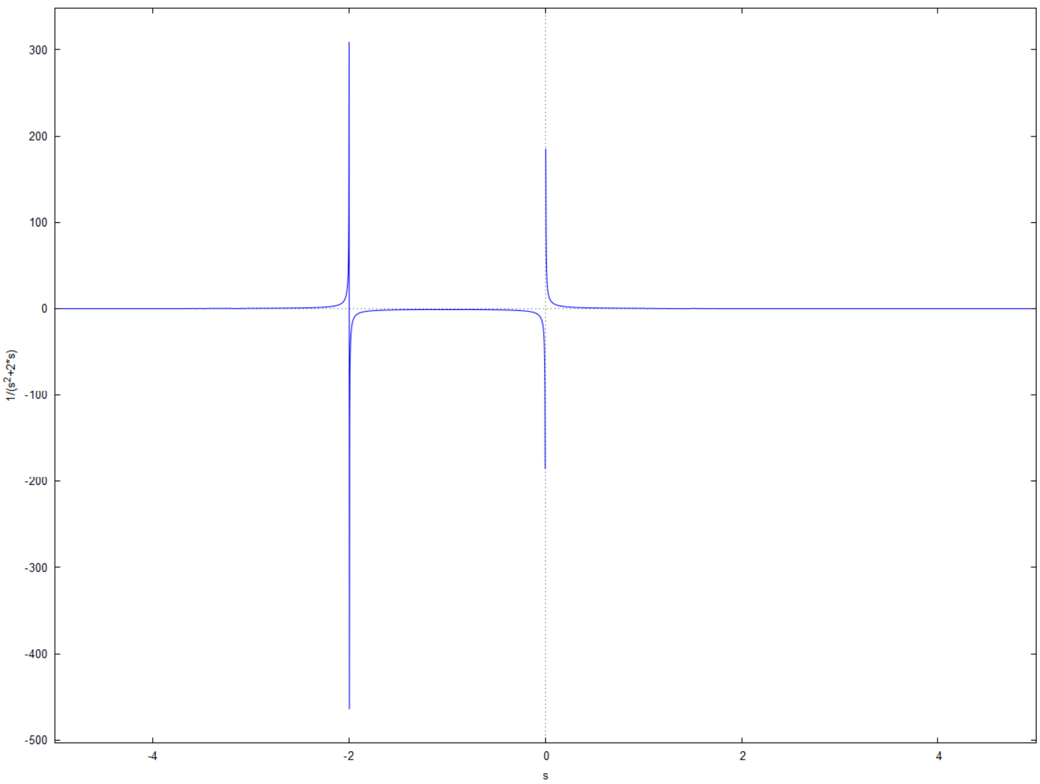


b) e^(-t) sinht:

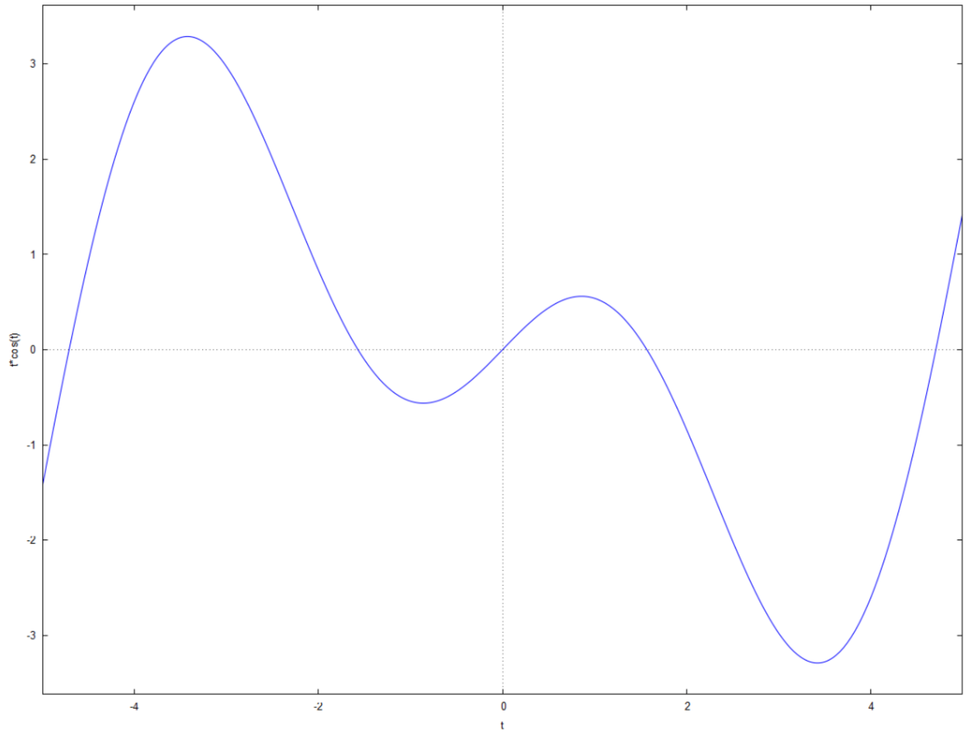


Laplace:

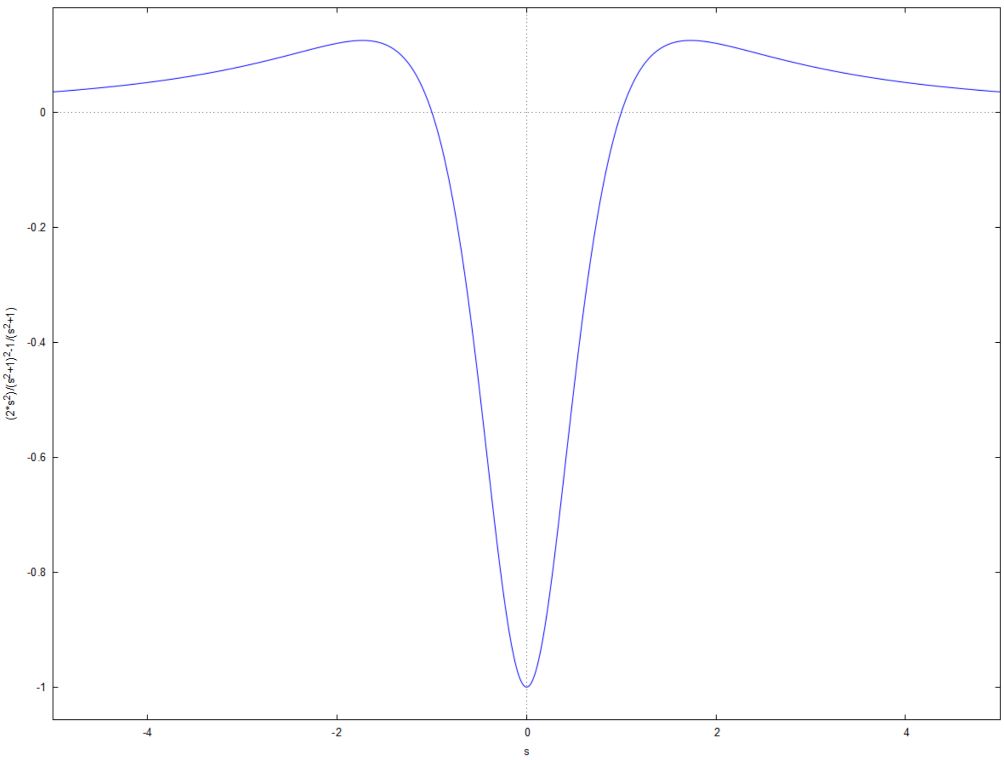
$$\frac{1}{s^2 + 2s}$$



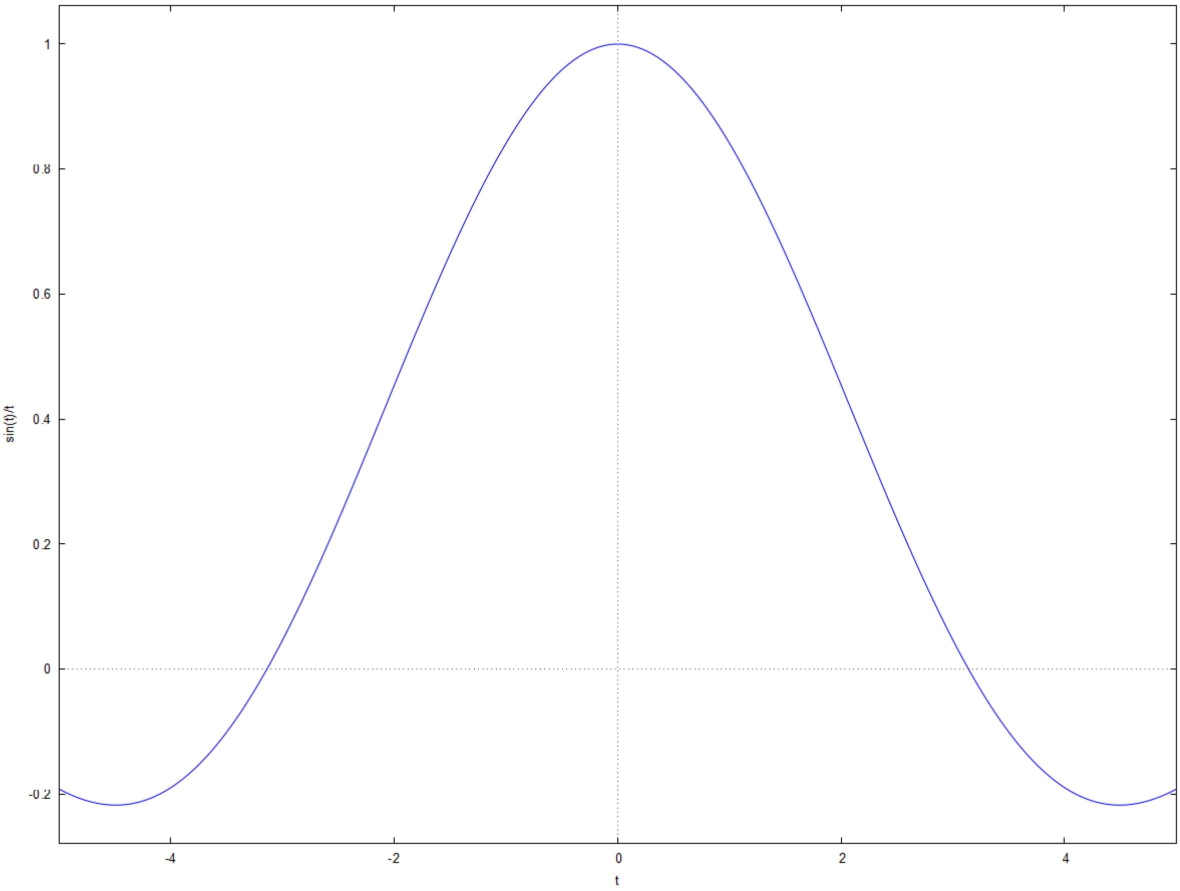
c) t cost:



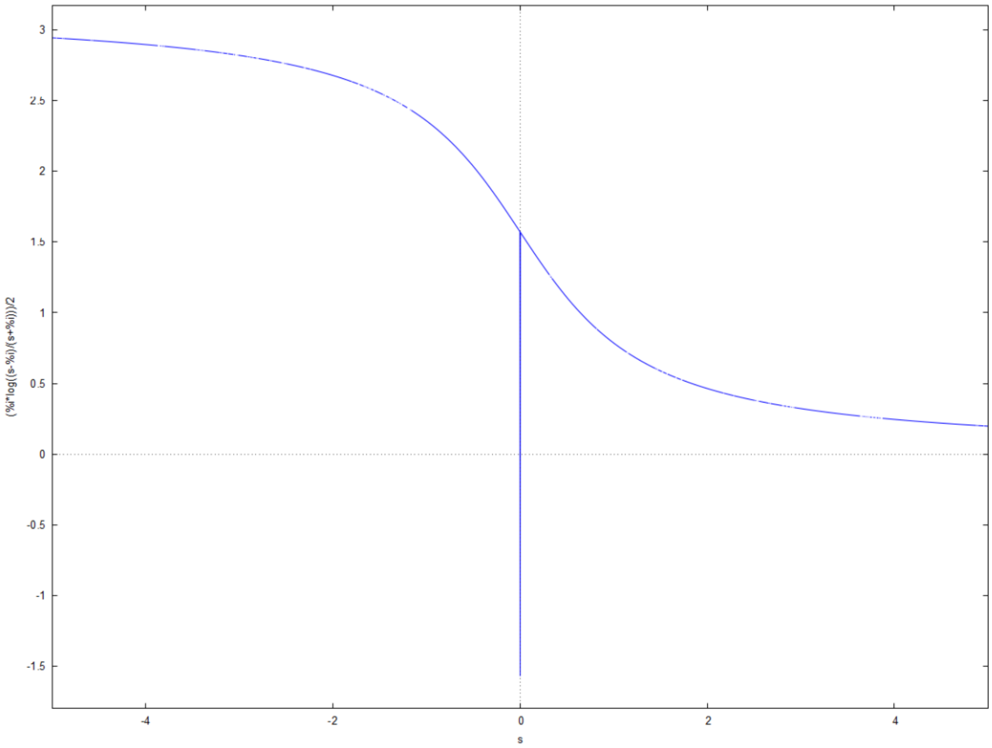
Laplace: $\frac{2s^2}{(s^2+1)^2} - \frac{1}{s^2+1}$



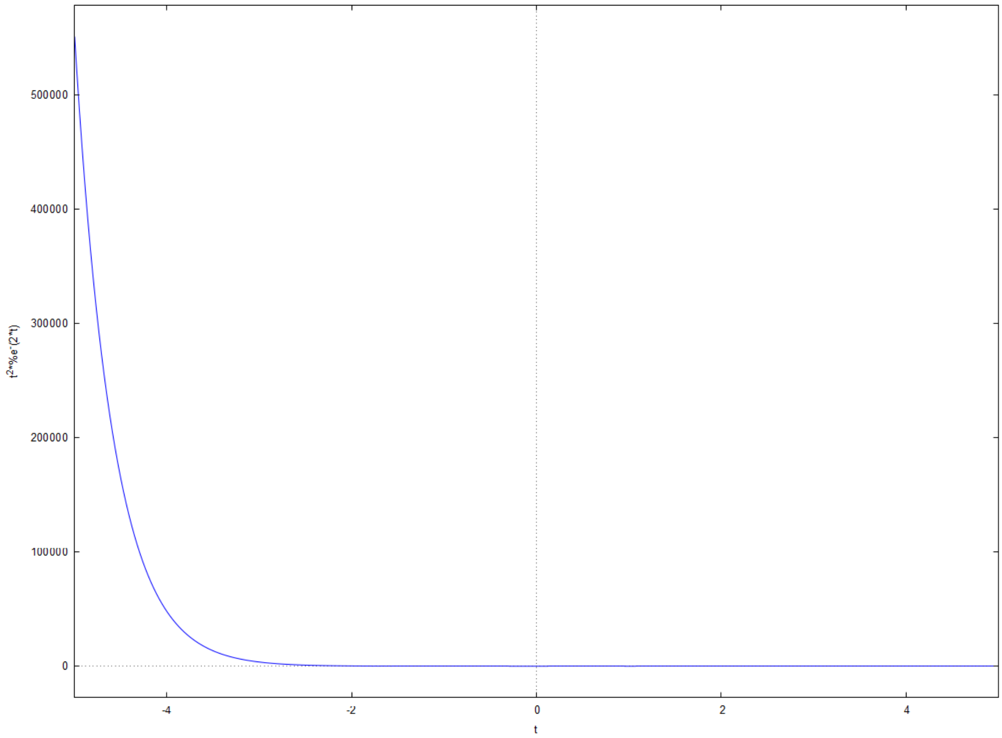
d) sint/t:



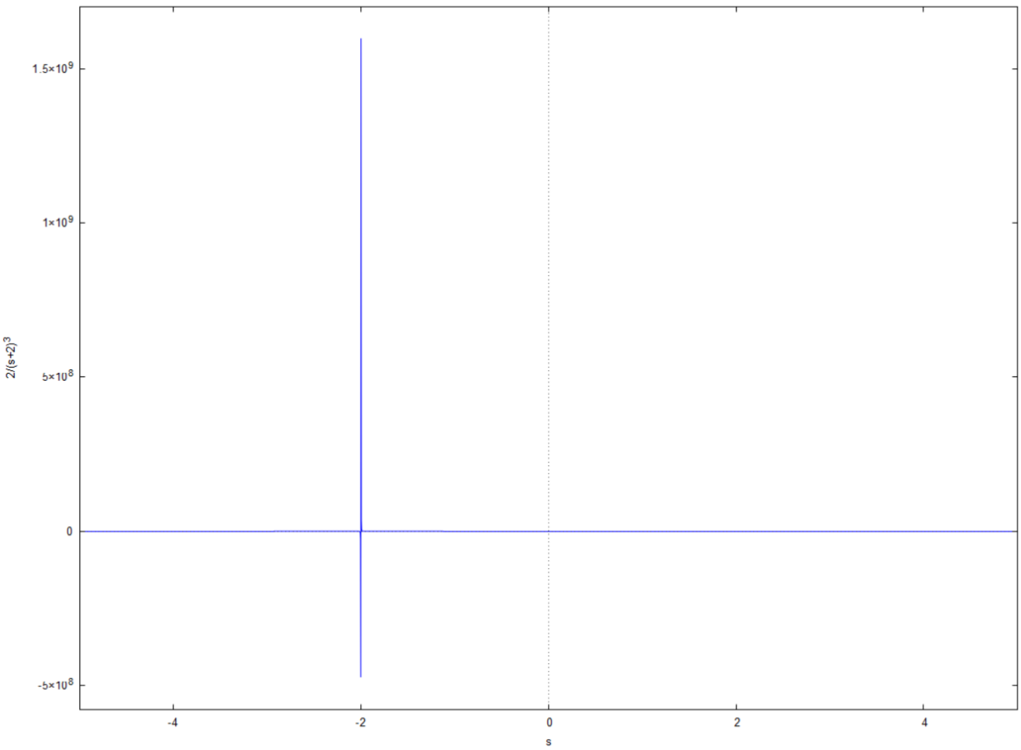
Laplace: $\frac{\%i\log(\frac{s-\%i}{s+\%i})}{2}$



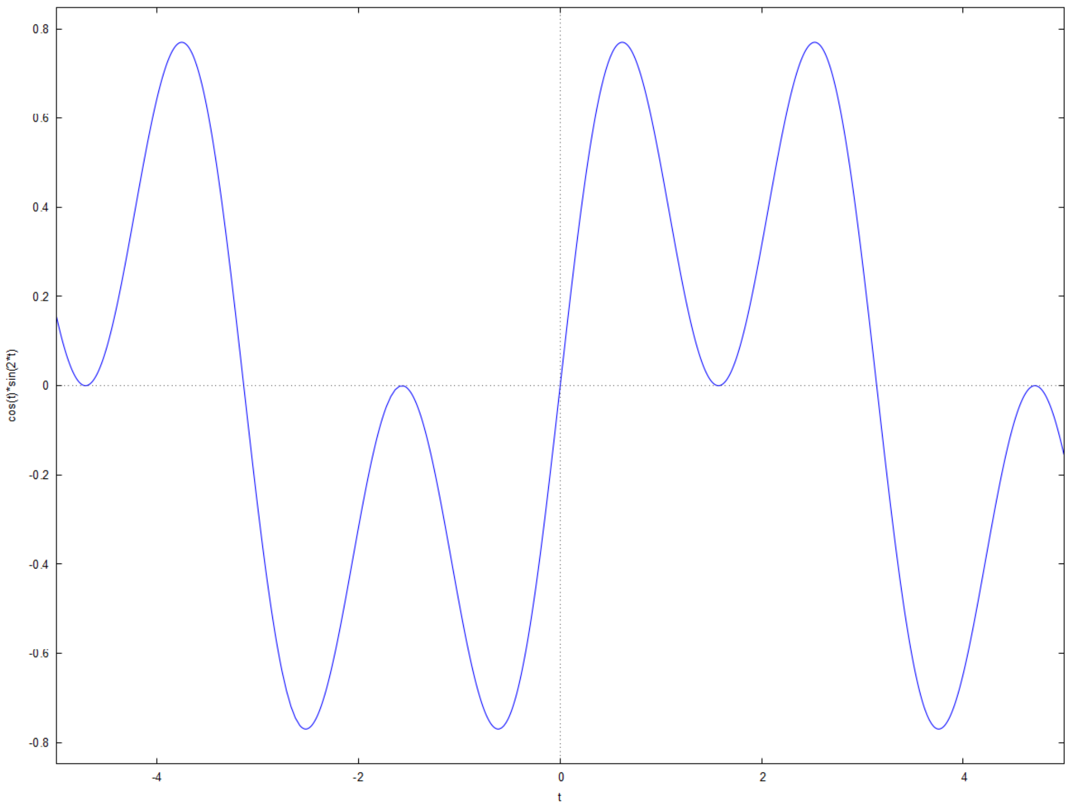
e) t^2 e^(-2)



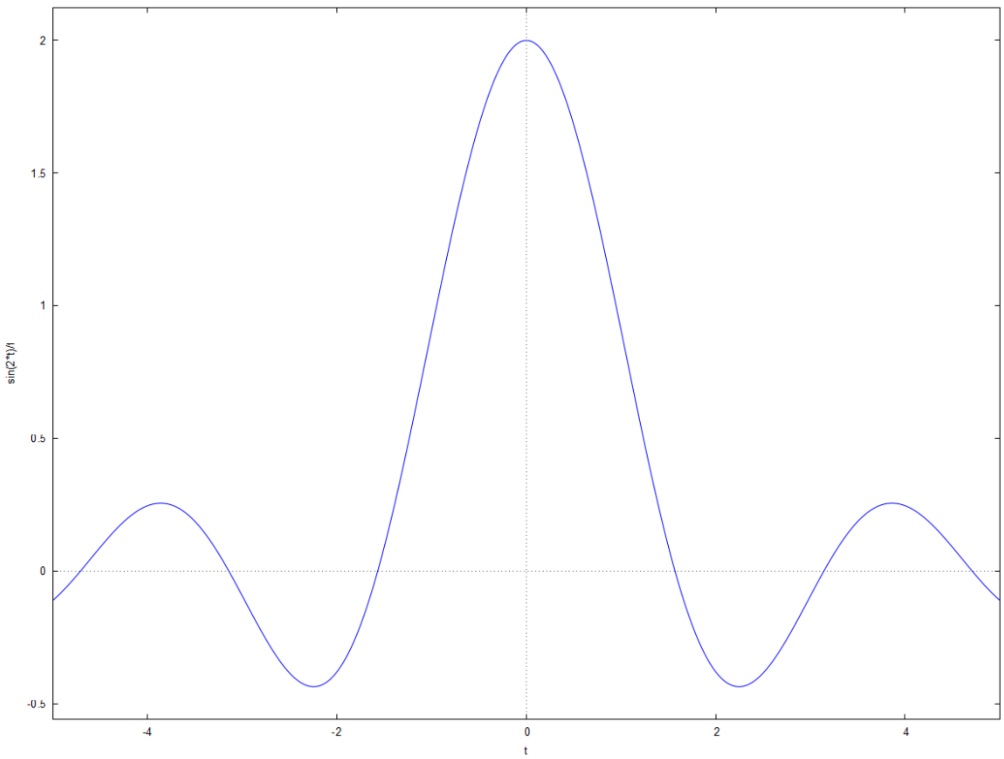
Laplace: $\frac{2}{(s+2)^3}$



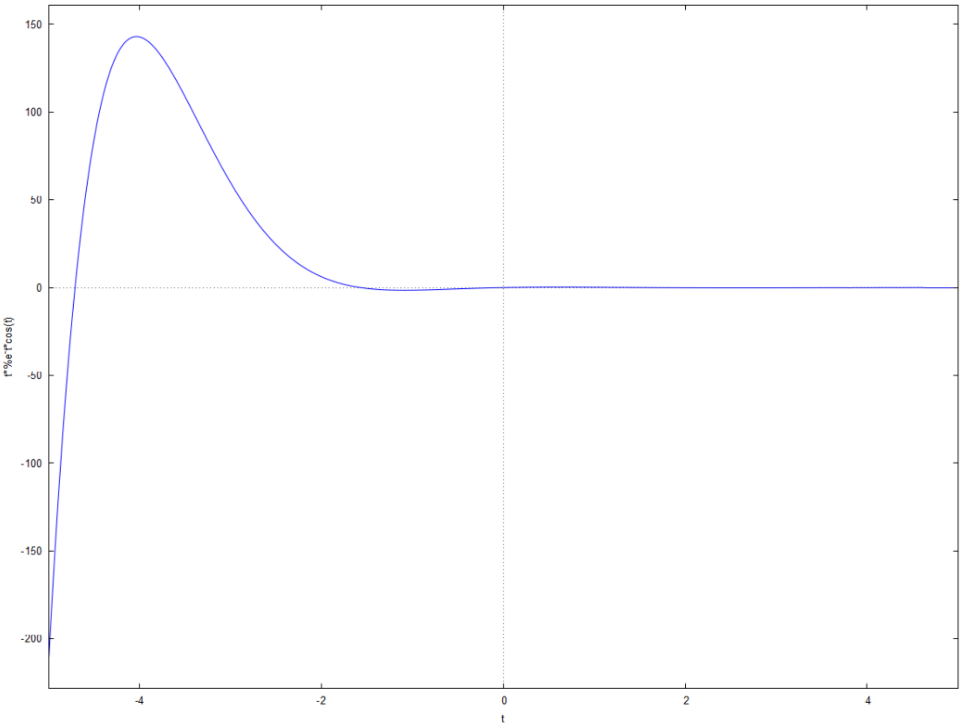
f) Cos t sin2t:



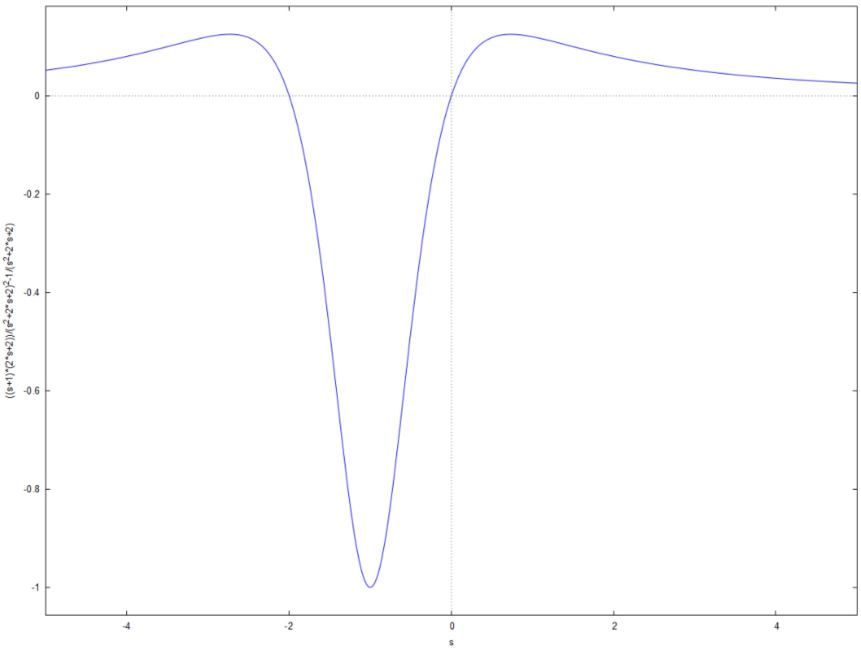
Laplace: $\frac{\sin(2t)}{t}$



g) te^(-t) cost:



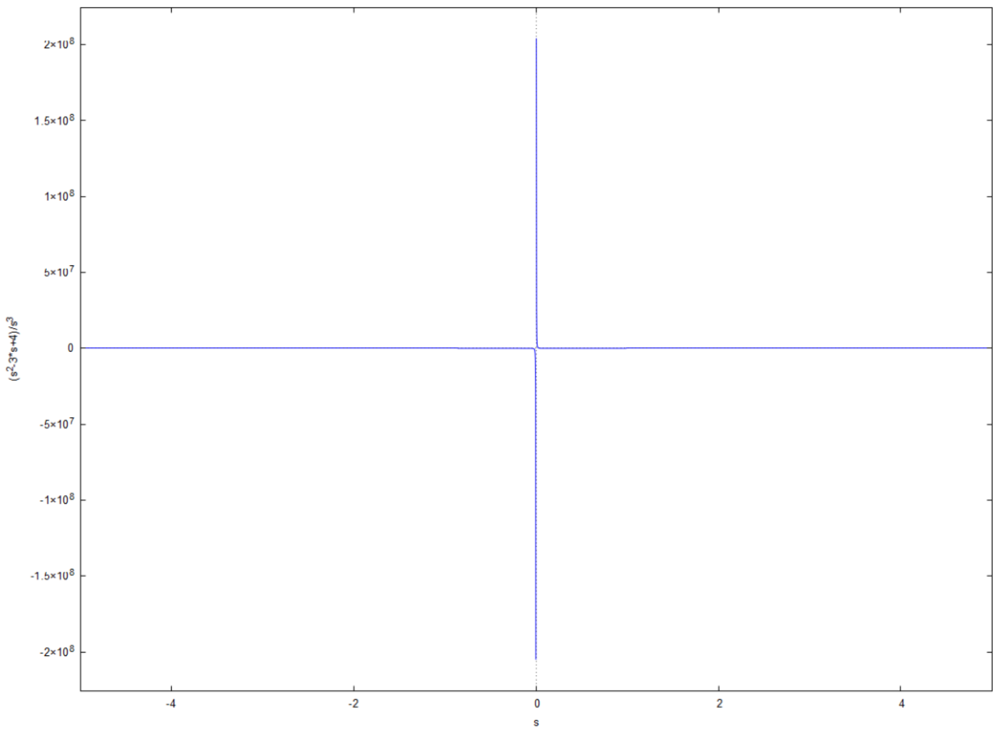
Laplace: $\frac{(s+1)(2s+2)}{(s^2+2s+2)^2} - \frac{1}{s^2+2s+2}$



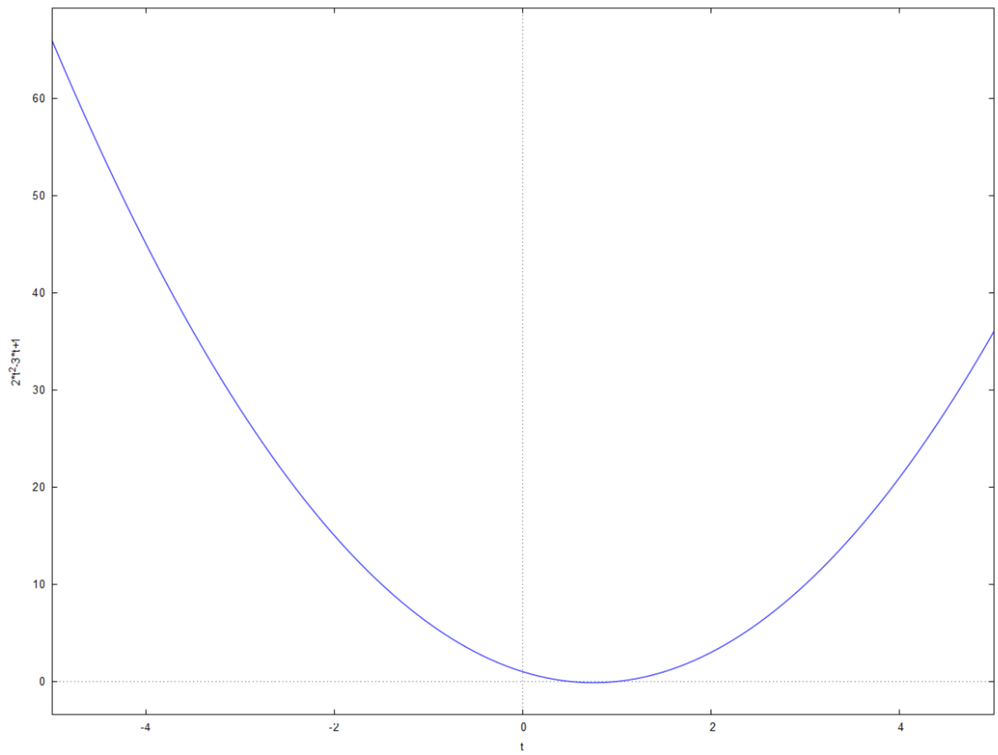
Practical 2B

Inverse Laplace Transform

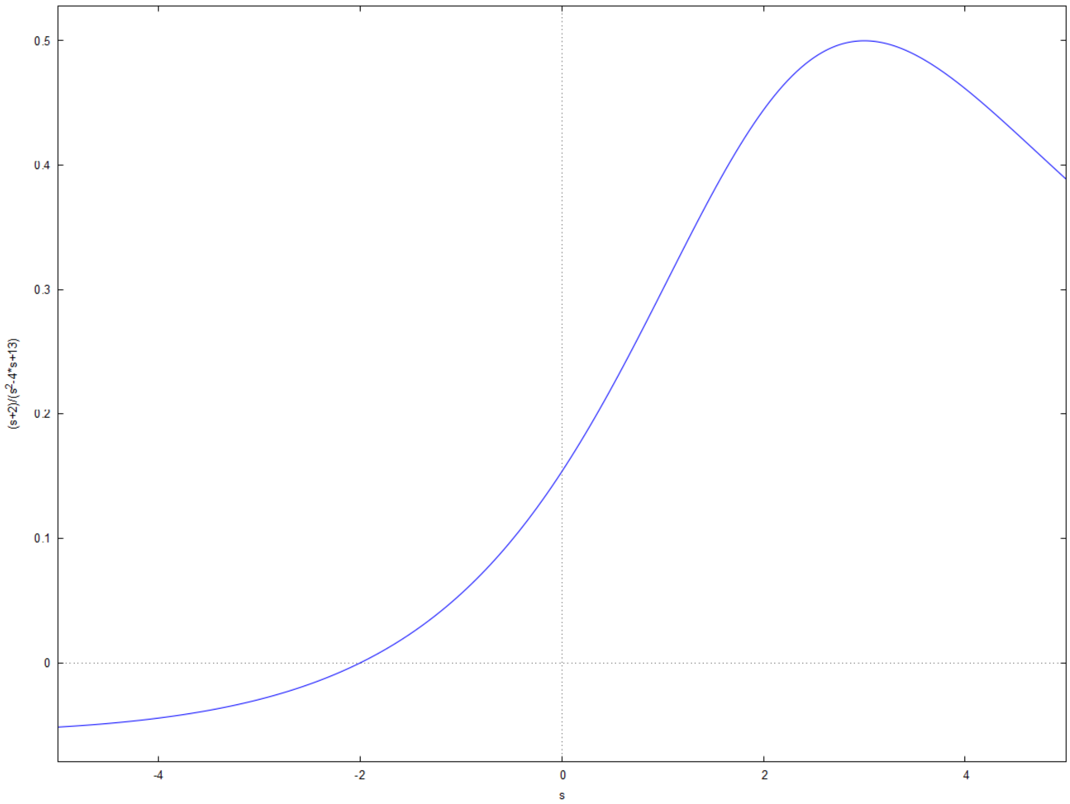
Q. (s^2-3*s+4)/(s^3)



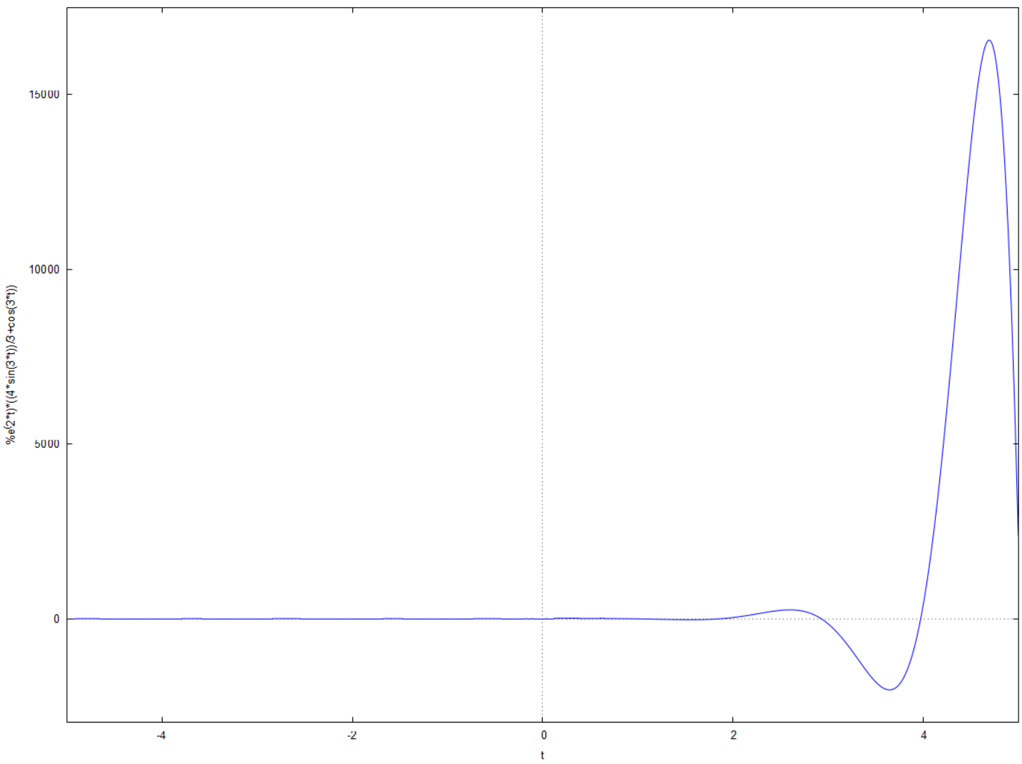
Inverse laplace: $2t^2 - 3t + 1$



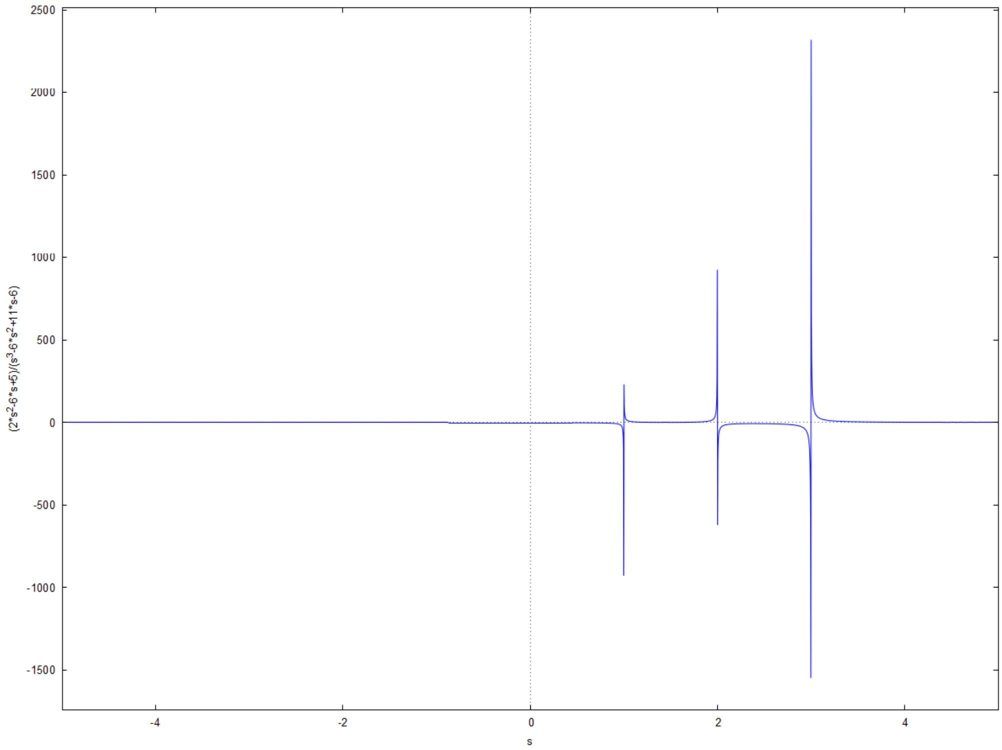
Q. (s+2)/(s^2-4*s+13)



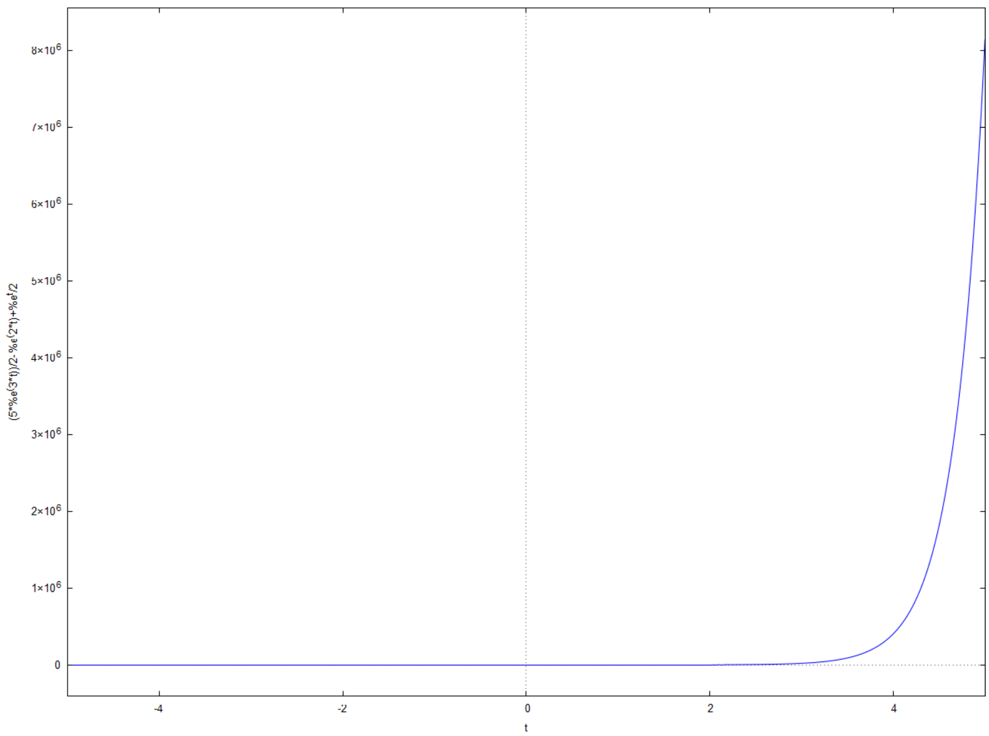
Inverse laplace: $\%e^{2t}(\frac{4\sin(3t)}{3}+\cos(3t))$



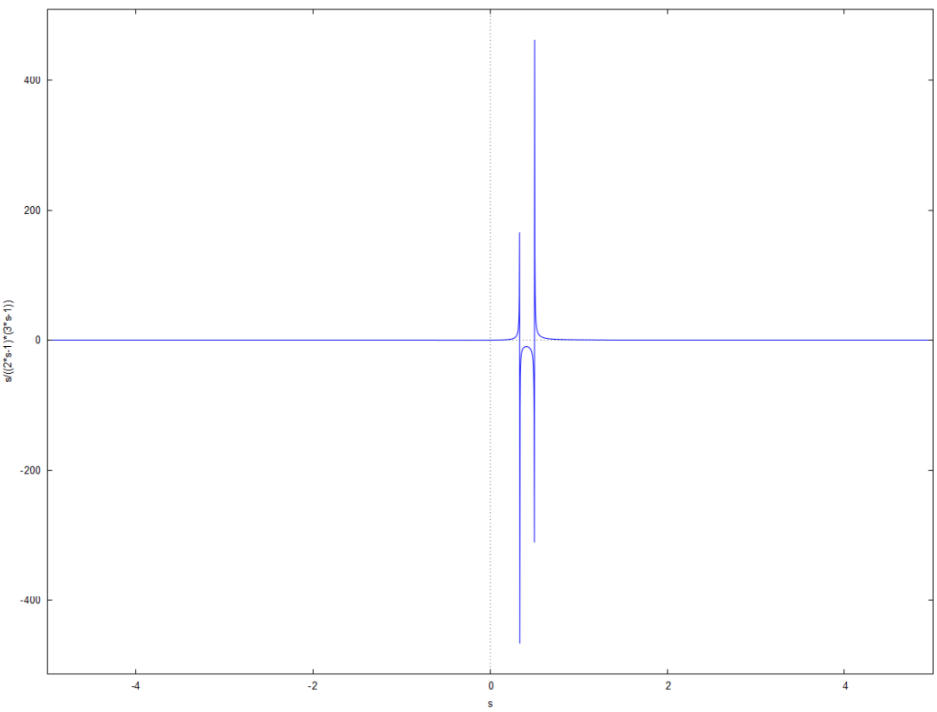
Q. (2*s^2-6*s+5)/(s^3-6*s^2+11*s-6)



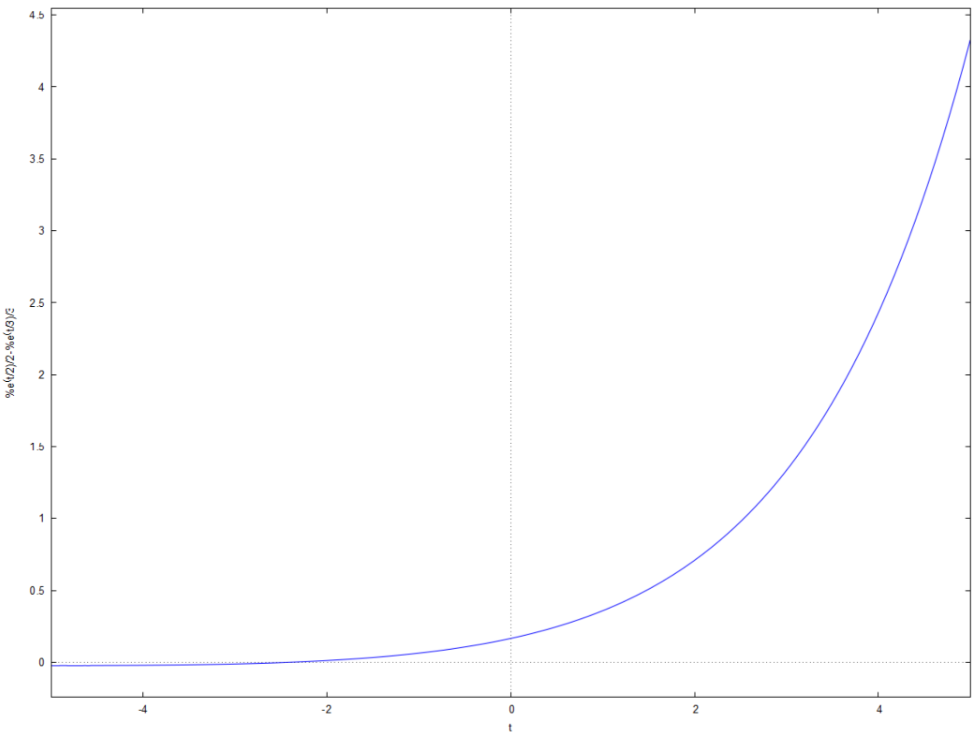
Inverse Laplace: $\frac{5\%e^{3t}}{2} - \%e^{2t} + \frac{\%e^{t}}{2}$



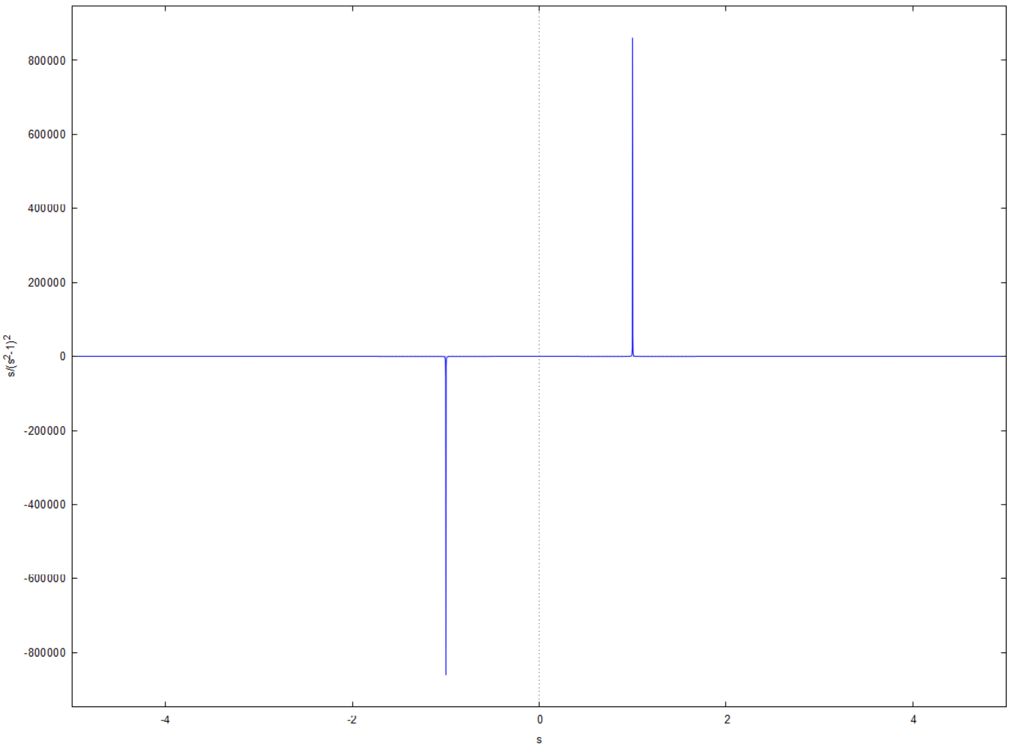
Q. (s)/((2*s-1)*(3*s-1))



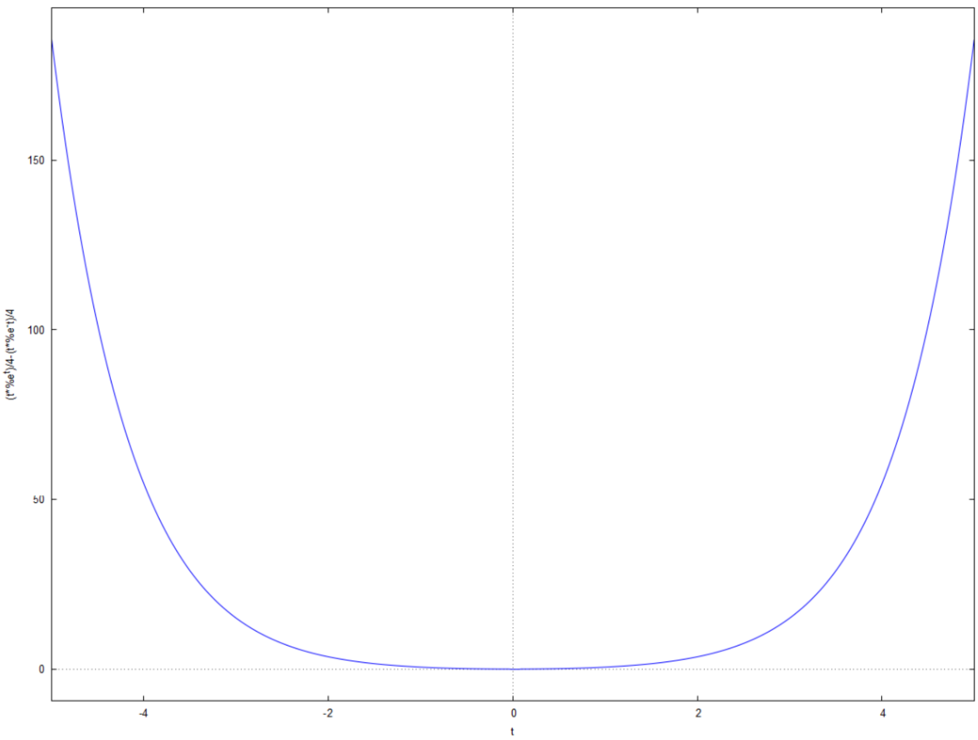
Inverse Laplace: $\frac{\%e^{\frac{t}{2}}}{2} - \frac{\%e^{\frac{t}{3}}}{3}$



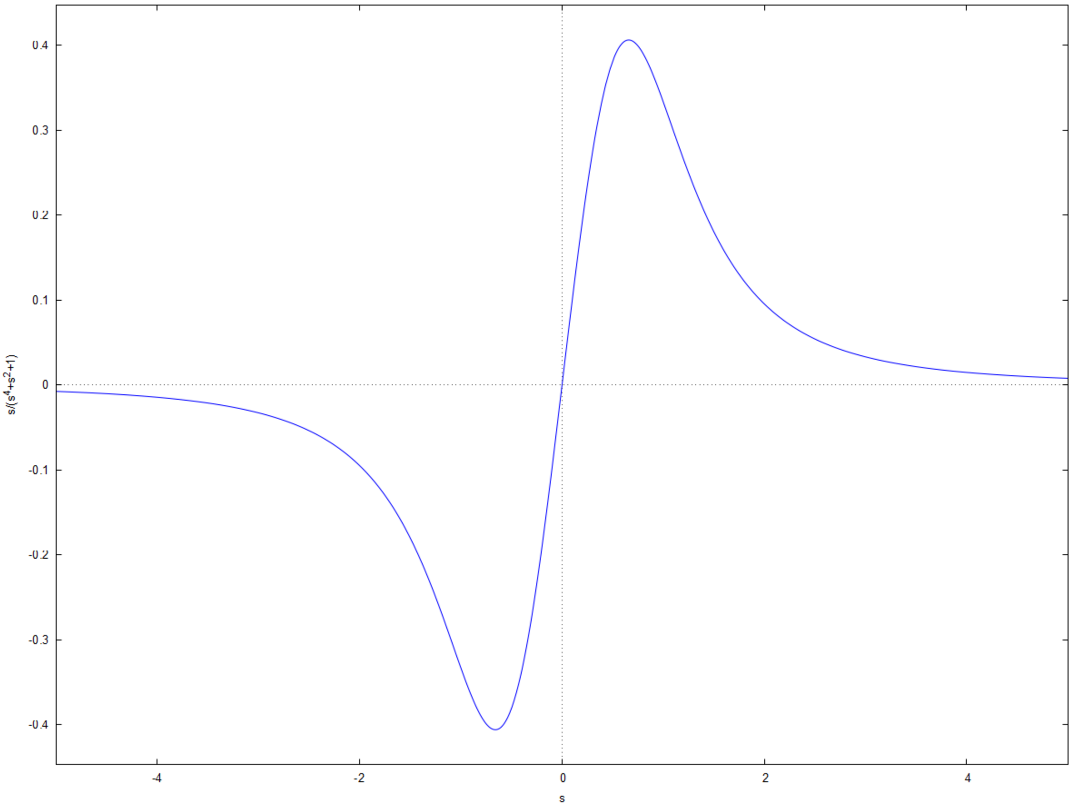
Q. (s)/(s^2-1)^2



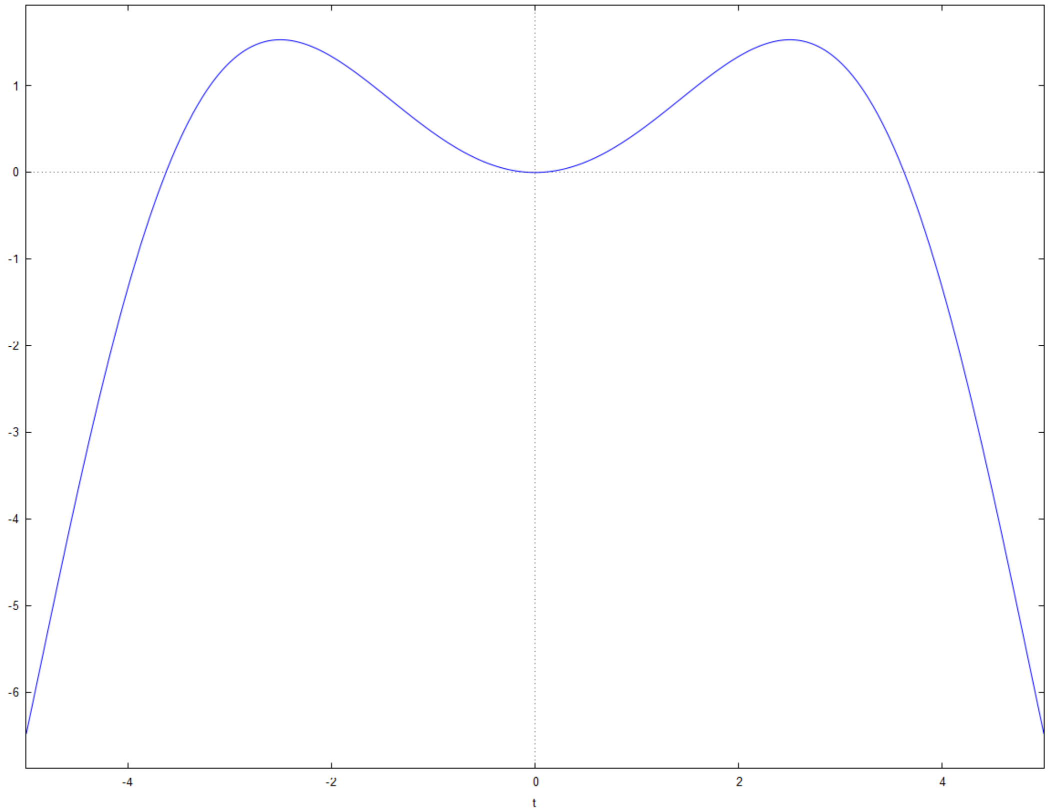
Inverse Laplace: $\frac{t\%e^{t}}{4} - \frac{t\%e^{-t}}{4}$



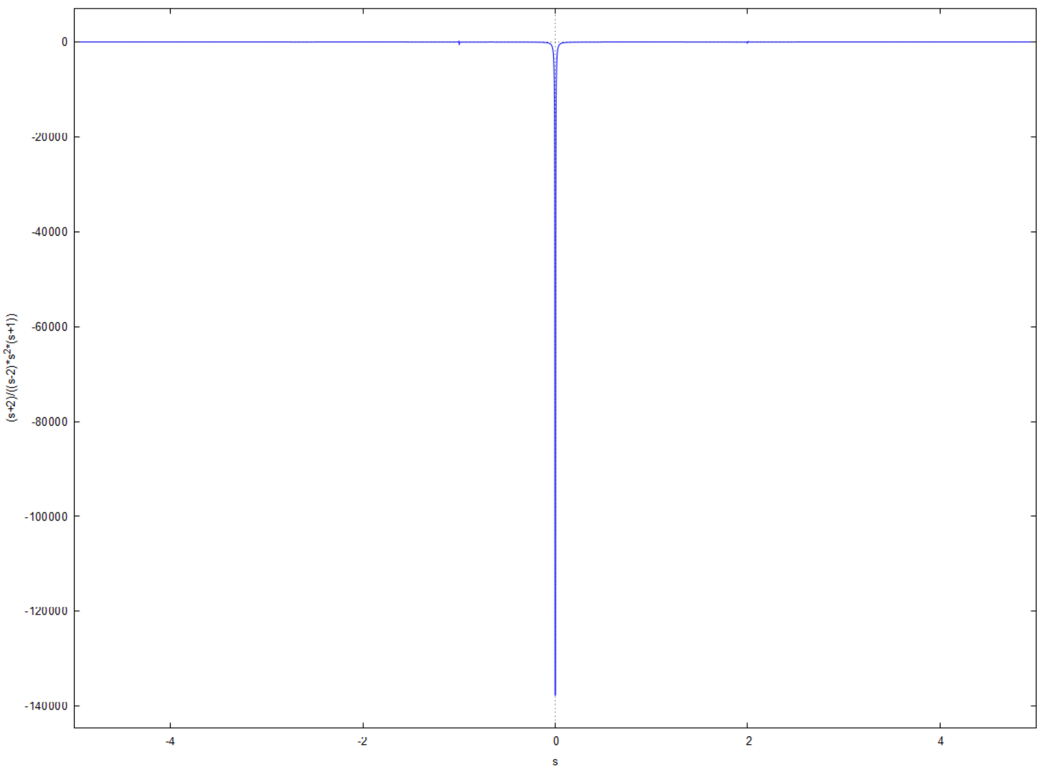
Q. (s)/(s^4+s^2+1)



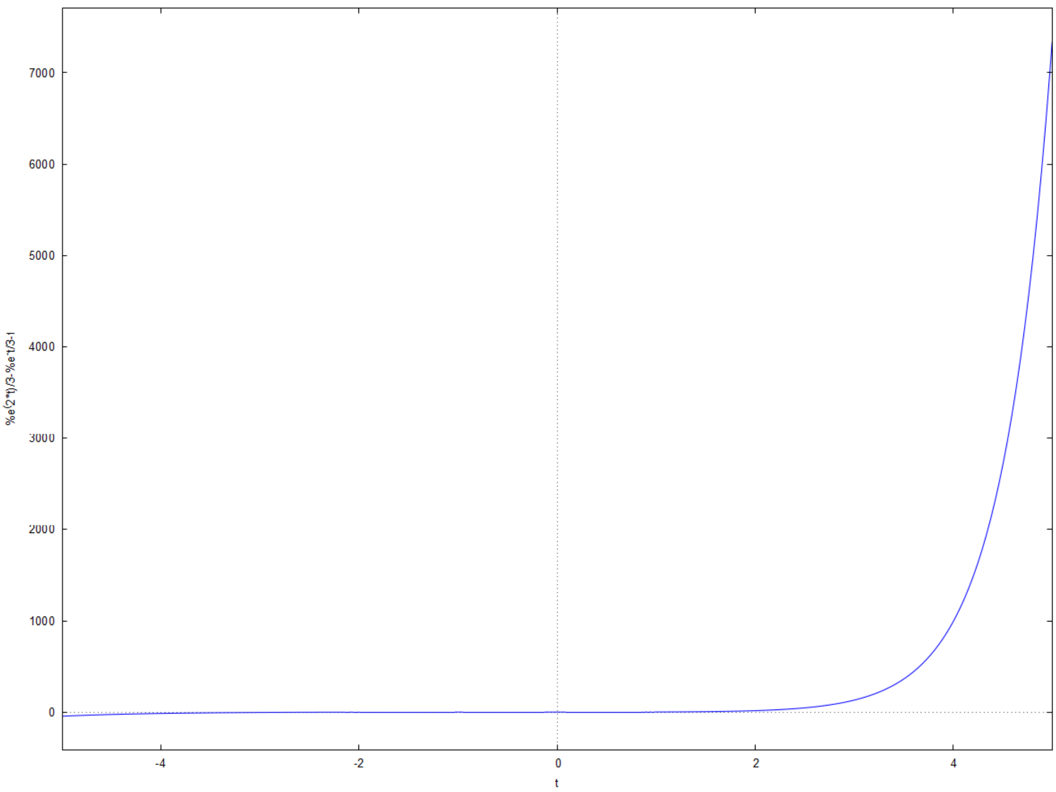
Inverse Laplace: $\frac{\%e^{\frac{t}{2}}\sin(\frac{\sqrt{3}t}{2})}{\sqrt{3}} - \frac{\%e^{-(\frac{t}{2})}\sin(\frac{\sqrt{3}t}{2})}{\sqrt{3}}$



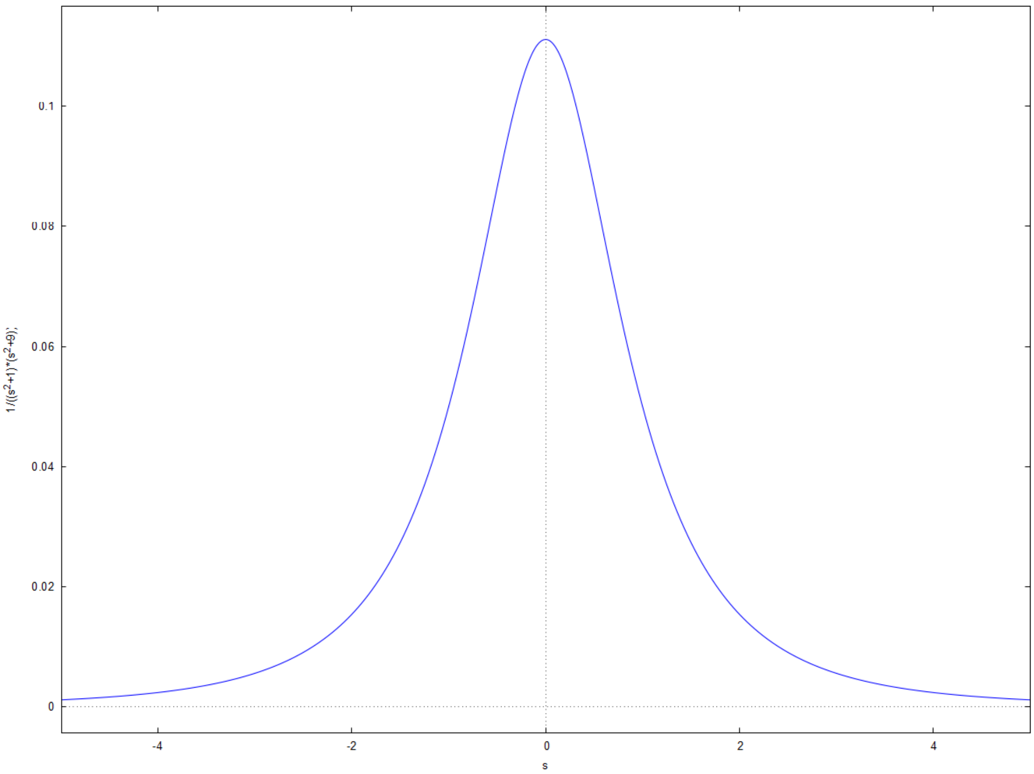
Q. (s+2)/(s^2*(s+1)*(s-2))



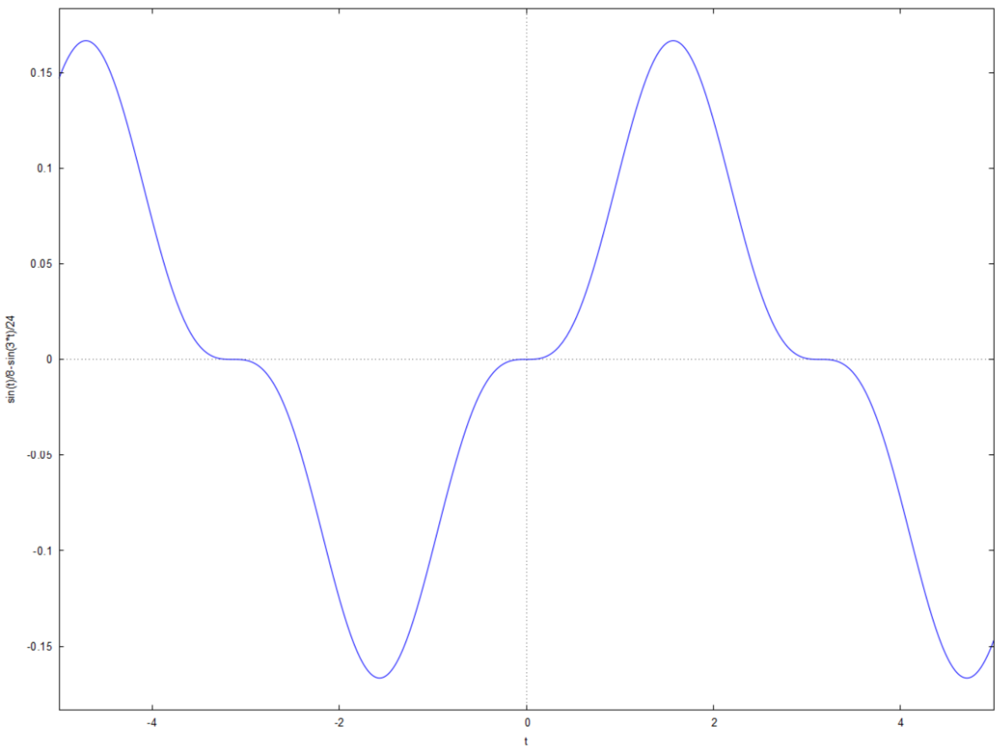
Inverse Laplace: $\frac{\%e^{2t}}{3} - \frac{\%e^{-t}}{3} - t$



Q. 1/((s^2+1)*(s^2+9))



Inverse Laplace:

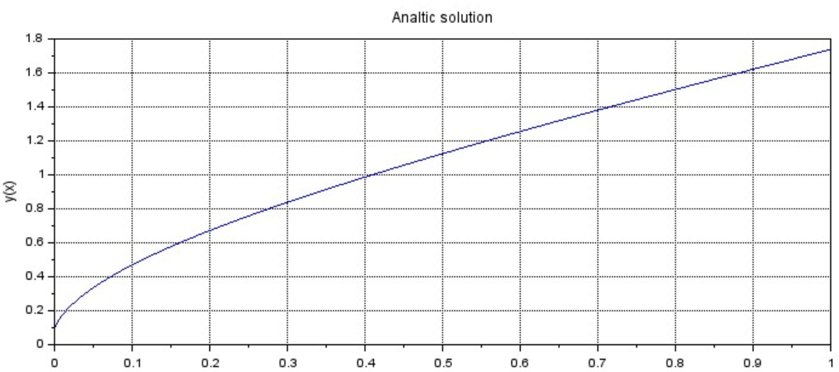


Practical 3

Differential Equation

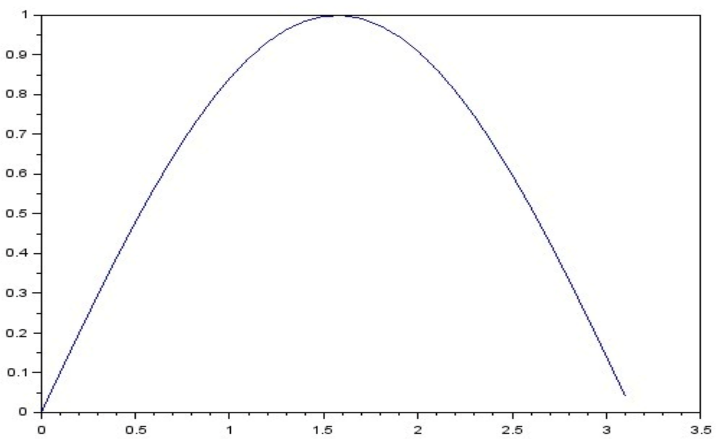
1]

```
x0=0; xinc=0.001; xf=1; x=x0:xinc:xf;
// Define x
// Calculate analytic solution
y=sqrt(x.^2+2*x+0.01);
//Plot analytic solution
subplot(2,1,1), plot(x,y), xgrid
ylabel('y(x)', 'fontsize', 2)
title('Analtic solution','fontsize', 2)
// Define differential equation
deff('yprim=f(x,y)','yprim=(x+1)/y');
// Solve differential equation
y0-0.1;
subplot(2,1,2), plot(x,ydiff,'r'), xgrid
title('Numeric solution', 'fontsize',2)
ylabel('y(x)', 'fontsize', 2)
ydiff=ode(y0,x0,x,f); // Plot numeric solution
xlabel('x','fontsize',2)
```



Ex 2

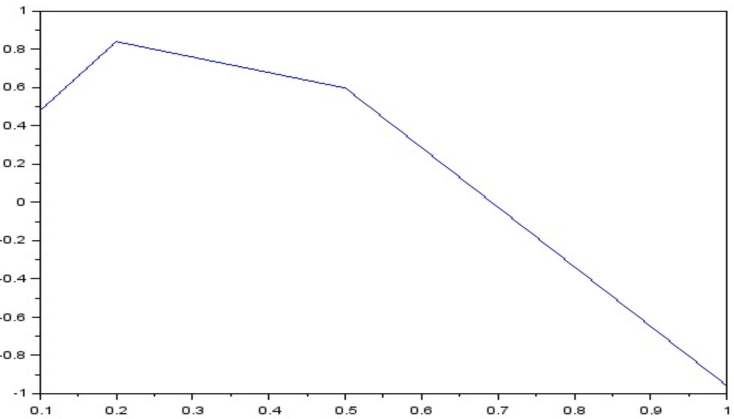
```
function ydot=f(t, y)
  ydot=y^2-y*sin(t)+cos(t)
endfunction
y0=0;
t0=0;
t=0:0.1:%pi;
y=ode(y0,t0,t,f);
plot(t,y)
```



Ex 3

```
function xdot=linear(t, x, A, u, B, omega)
   xdot=A*x+B*u(t,omega)
endfunction
function ut=u(t, omega)
  ut=sin(omega*t)
endfunction
 A= [1 1:0 2];
B=[1;1];
omega=5;
```

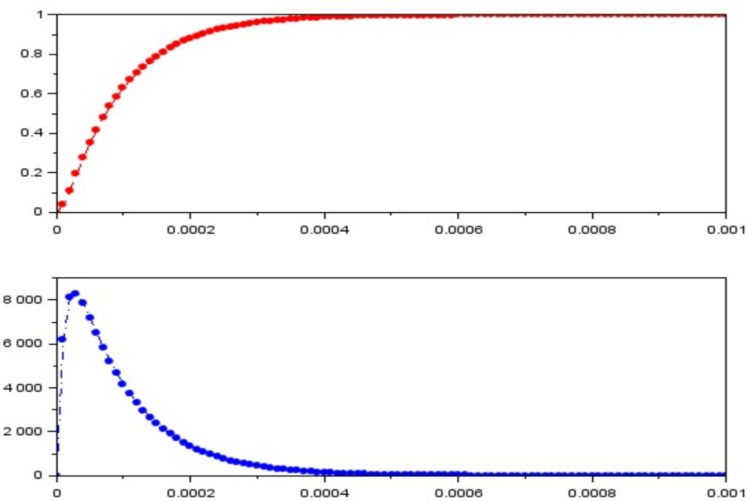
```
y0=[1;0];
t0=0;
t=[0.1,0.2,0.5,1];
ode(y0, t0,t,list(linear, A,u,B,omega))
plot(t,u);
```



Ex 4

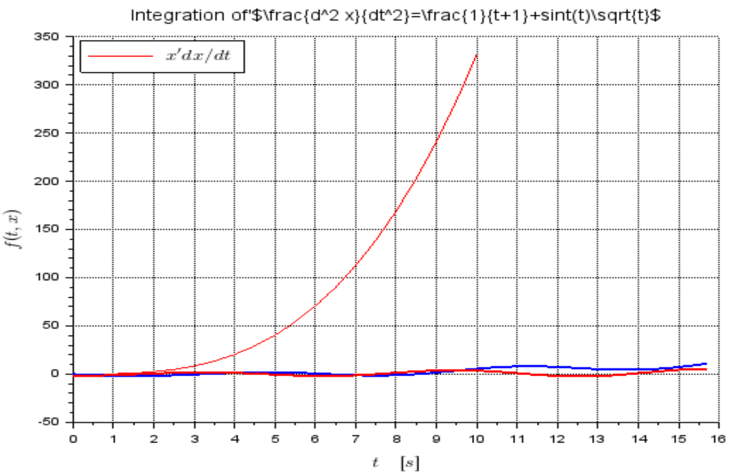
```
function y=u(t)
   y=(sign(t)+1)/2
endfunction
L=0.001
R=10
C=0.000001
function zdot=f(t,y)
   zdot(1)=y(2);
   zdot(2)=(u(t)-y(1)-L*y(2)/R)/(L*C);
endfunction
y0=[0;0];
t0=0;
t=0:0.00001:0.001;
out=ode(y0,t0,t,f);
clf();
```

```
plot(out);
function y=u(t)
   y=(sign(t)+1)/2
endfunction
L=0.001
R=10
C=0.000001
function zdot=f(t,y)
   zdot=[y(2);(u(t)-y(1)-L*y(2)/R)/(L*C)];
endfunction
y0=[0;0];
t0=0;
t=0:0.00001:0.001;
out=ode(y0,t0,t,f);
clf();
subplot(211)
plot(t,out(1,:),"r.--");
subplot(212)
plot(t,out(2,:),"b-..");
```



Ex 5

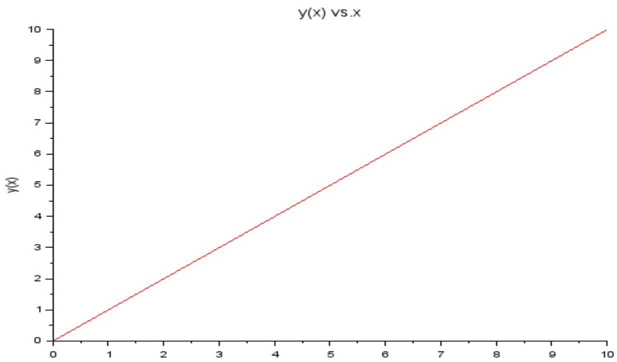
```
function dx=f(t, x)
   dx(1)=x(2);
   dx(2)=1/(t+1)+sin(t)*sqrt(t);
endfunction
t=0:0.01:5*%pi;
t0=min(t);
y0=[0;-2];
y=ode(y0,t0,t,f);
plot(t,y(1,:),'LineWidth',2)
plot(t,y(2,:),'r','LineWidth',2)
xgrid();
xlabel('$t\quad[s]$','FontSize',3)
ylabel('$f(t,x)$','FontSize',3)
title(['Integration of''$\frac{d^2 x}{dt^2}=\frac{1}{t+1}+sint(t)\sqrt{t}$'],'FontSize',3)
legend(['$\Large{x}$''$\Large{dx/dt}$'],2)
```



Ex 6

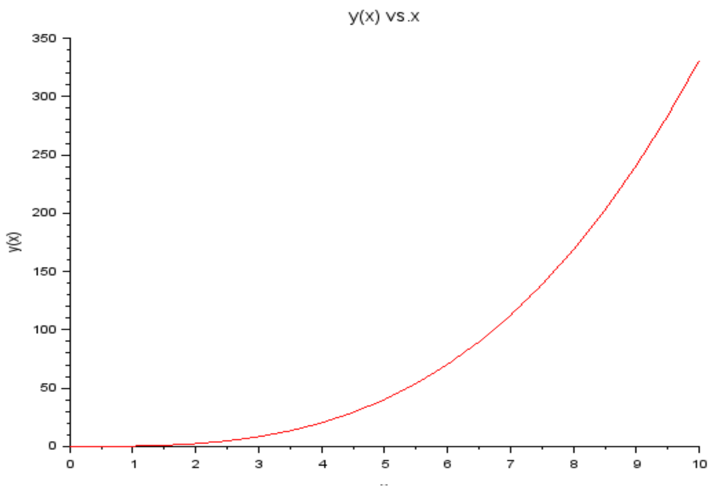
```
funcprot(0)
clf;
function dx=f(x, y)
   dx=exp(-x0);
endfunction
y0=0;
x0=0;
x=[0:0.5:10];
sol=ode(y0,x0,x,f);
plot2d(x,sol,5)
```

```
xlabel('x');
ylabel('y(x)');
xtitle('y(x) vs.x')
```



Ex 7

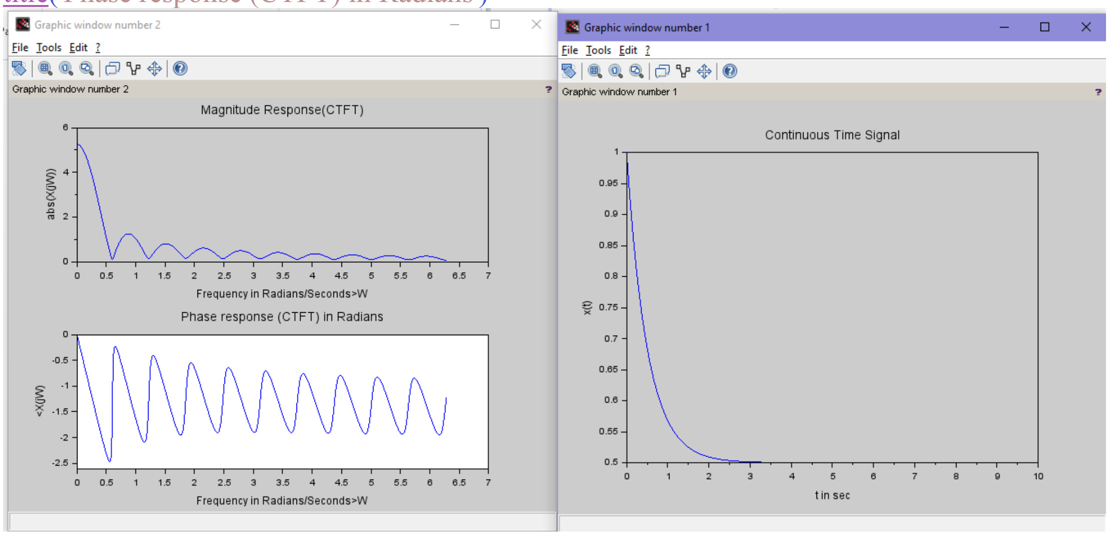
```
funcprot(0)
clf;
function dx=f(x, y)
   dx=x^2-exp(-x)*y;
endfunction
y0=0;
x0=0;
x=[0:0.5:10];
sol=ode(y0,x0,x,f);
plot2d(x,sol,5)
xlabel('x');
ylabel('y(x)');
xtitle('y(x) vs.x')
```



Practical 4A

A]

```
clear;
//Fourier Transform of x(t)=exp(-a*t)*cos(wc*t)*u(t)
clear;
clc;
a=1;
wc=1;
Dt=0.005;
t=0:Dt:10;
xt=(exp(t*(-a+wc))+exp(t*(-a-wc)))/2;
Wmax=2*%pi*1;
K=4;
k=0:(K/1000):K
W=k*Wmax/K;
XW=xt*exp(-sqrt(-1)*t'*W)*Dt;
XW_Mag=abs(XW);
[XW_Phase,db]=phasemag(XW);
//Plotting Continuos Time Signal
figure(1)
plot(t,xt);
xlabel('t in sec');
ylabel('x(t)')
title('Continuous Time Signal')
figure(2)
//Plotting Magnitude Response of CTS
subplot(2,1,1)
plot(W,XW_Mag);
xlabel('Frequency in Radians/Seconds>W');
ylabel('abs(X(jW))')
title('Magnitude Response(CTFT)')
//Plotting Phase Response of CTS
subplot(2,1,2);
plot(W,XW_Phase*%pi/180);
xlabel('Frequency in Radians/Seconds>W');
ylabel('<X(jW)')
title('Phase response (CTFT) in Radians')
```

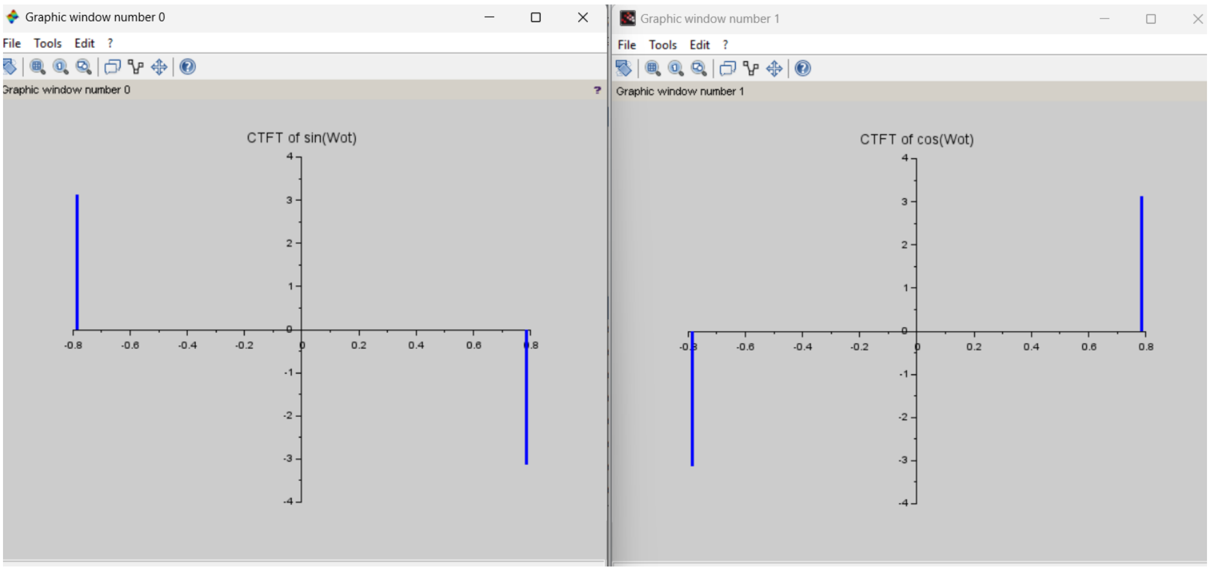


B]

```
//Continuous Time Fourier Transforms of
// Sinusoidal waveforms (a)sin(Wot) (b)cos(Wot)
clear;
clc;
close;
//CTFT
T1 = 2;
T=4*T1;
Wo=2*%pi/T;
W=[-Wo,0,Wo];
ak =(2*%pi*Wo*T1/%pi)/sqrt(-1)
XW=[-ak,0,ak]
ak1=(2*%pi* Wo*T1/%pi);
XW1=[-ak1,0,ak1]
figure;
a=gca();
a.y_location="origin";
a.x_location="origin";
plot2d3('gnn',W,imag(XW),2);
poly1=a.children(1).children(1);
poly1.thickness=3;
xlabel('')
title('CTFT of sin(Wot)')
figure
a=gca();
a.y_location="origin";
a.x_location="origin";
plot2d3('gnn', W,XW1,2);
poly1=a.children(1).children(1);
poly1.thickness=3;
```

xlabel('')

title('CTFT of cos(Wot)')



C] clear;

*//Fourier Transform of x(t) exp(-t)*sin(wc*t)*u(t)*

clear;

clc;

wc=1;

Dt =0.005;

t=0:Dt:10;

xt=(exp(t*(-1+ wc))-exp(t*(-1-wc)))/(2*%i);

Wmax=2*%pi*1;

K =4;

k = 0:(K / 1000):K;

W=k*Wmax/k

XW=xt*exp(-sqrt(-1)*t'*W)*Dt;

XW_Mag=abs(XW);

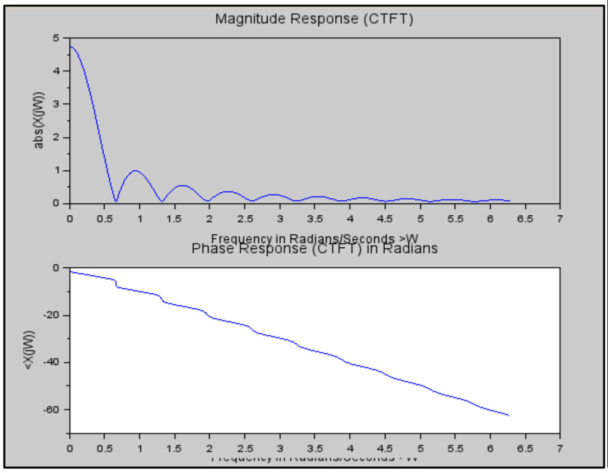
[XW_Phase,db]=phasemag(XW);

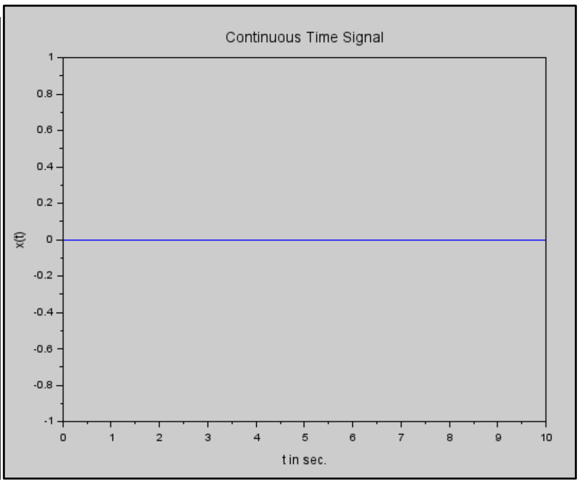
//Plotting Continuous Time Signal

figure(1)

plot(t,xt);

```
xlabel('t in sec.');
ylabel('x(t)');
title('Continuous Time Signal')
figure(2);
//Plotting Magnitude Response of CTS
subplot(2,1,1);
plot(W,XW_Mag);
xlabel('Frequency in Radians/Seconds>W')
ylabel('abs(X(jW))')
title('Magnitude Response (CTFT)')
//Plotting Phase Reponse of CTS
subplot(2,1,2);
plot(W,XW_Phase*%pi/180);
xlabel('Frequency in Radians/Seconds>W');
ylabel('<X(jW)')
title('Phase Response(CTFT) in Radians')
```

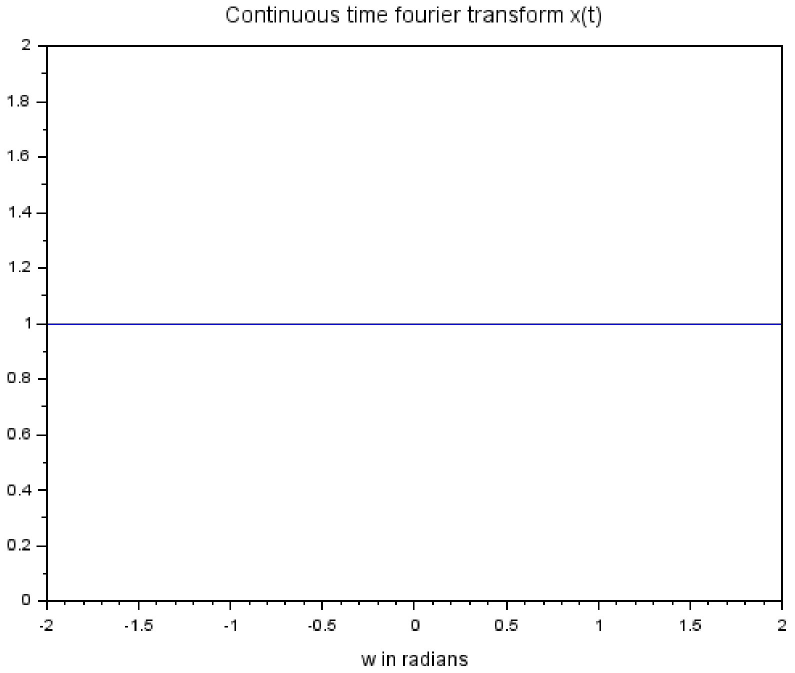


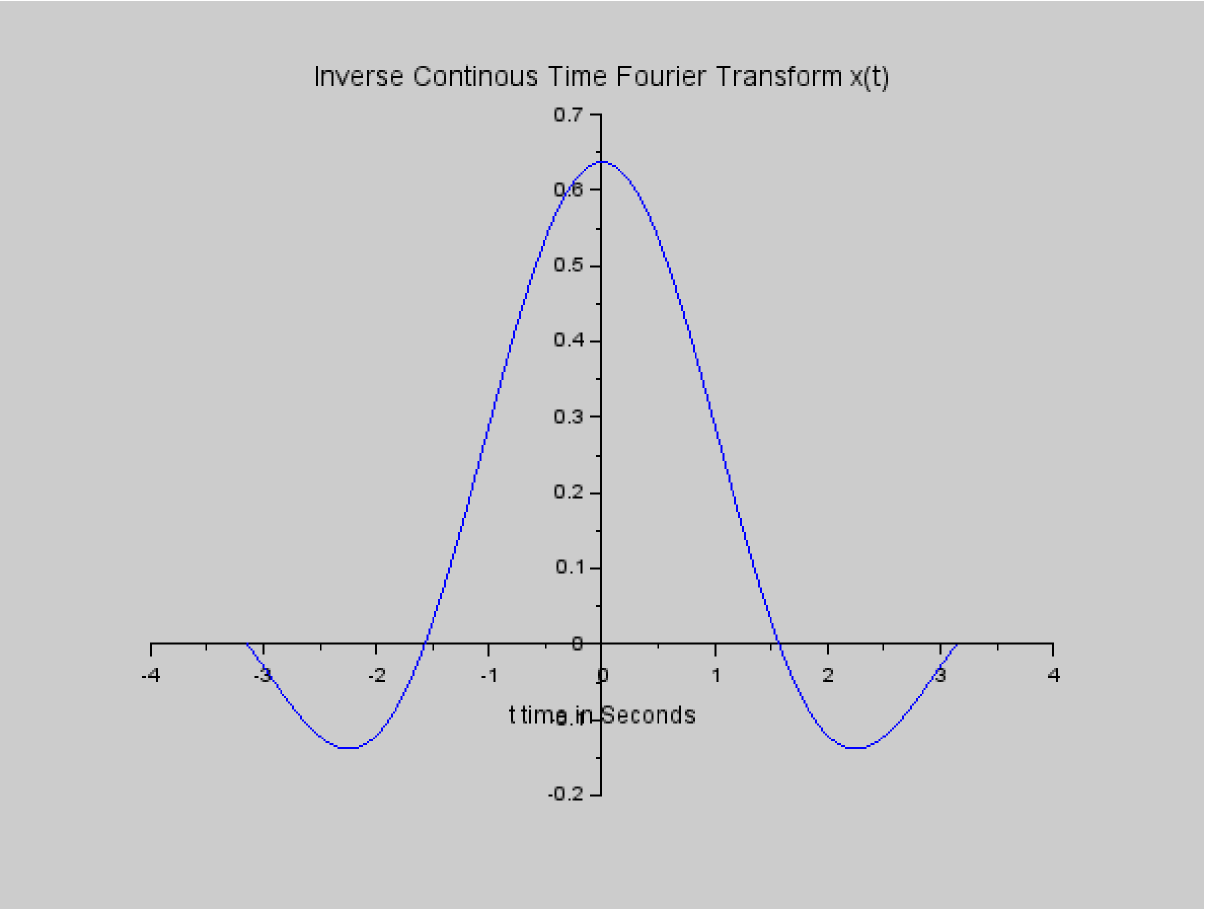


Practical 4B

```
//Inverse Continuous Time Fourier Transform
//X(jW)=1, from -T1 to T1
clear;
clc;
close;
//CTFT
A=1;  //Amplitude
Dw=0.006;
W1=4;   //Time in seconds
w=-W1/2:Dw:W1/2;
for i=1:length(w)
    XW(i)=A;
end
XW=XW';
plot(w,XW);
xlabel('w in radians');
title('Continuous time fourier transform x(t)')
//
//Inverse continuous-time Fourier Transform
t=-%pi:%pi/length(w):%pi;
xt=(1/(2*%pi))*XW*exp(sqrt(-1)*w'*t)*Dw;
xt=real(xt);
figure
a=gca();
a.y_location="origin";
a.x_location="origin";
plot(t,xt);
xlabel('t time in Seconds');
```

title('Inverse Continous Time Fourier Transform x(t)')





Practical 4C

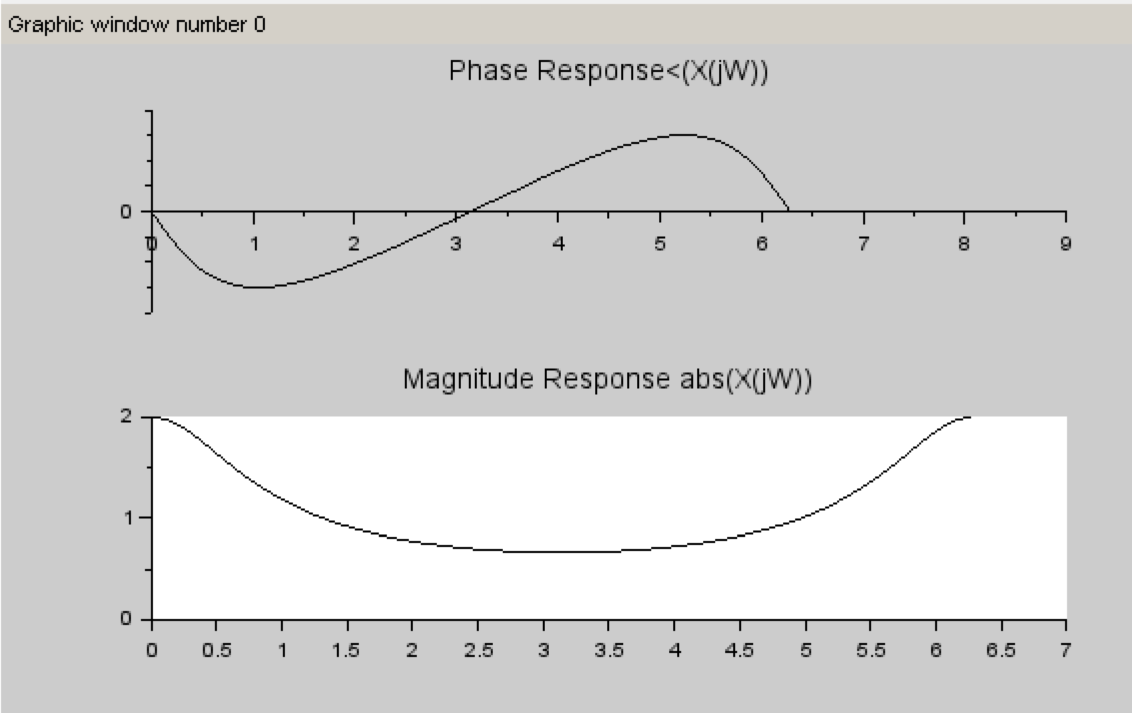
DISCRETE TIME FOURIER TRANSFORM

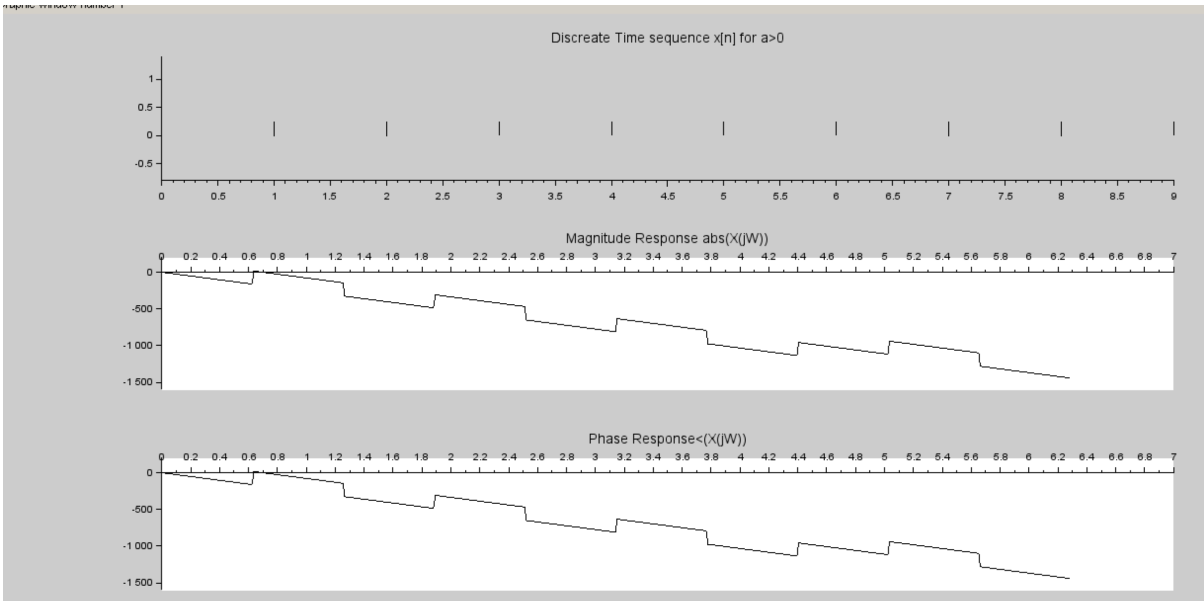
1)

```
//Discreate time fourier tranform of discreate sequence x[n]=(a^n).u[n].a>0 and a<0
clear;
clc;
close;
//DTS signal
a1=0.5;
a2=-0.5;
max_limit=10;
for n=0:max_limit-1
   x1(n+1)=(a1^n);
   x2(n+1)=(a2^2);
end
n=0:max_limit-1;
//discreate time fourier transform
Wmax=2*%pi;
K=4;
k=0:(K/1000):K;
W=k*Wmax/K;
x1=x1';
x2=x2';
XW1=x1*exp(-sqrt(-1)*n'*W);
XW2=x2*exp(-sqrt(-1)*n'*W);
XW1_Mag=abs(XW1);
XW2_Mag=abs(XW2);
[XW1_Phase,db]=phasemag(XW1);
[XW2_Phase,db]=phasemag(XW2);
//plot for a>0
figure
```

```
subplot(3,1,1);
plot2d3('gnn',n,x1);
xtitle('Discrete Time Sequence x[n] for a>0')
subplot(3,1,2);
a=gca();
a.y_location="origin";
a.x_location="origin";
plot2d(W,XW1_Mag);
title('Magnitude Response abs(X(jW))')
subplot(3,1,1);
a=gca();
a.y_location="origin";
a.x_location="origin";
plot2d(W,XW1_Phase);
title('Phase Response<(X(jW))')
//plot for a<0
figure
subplot(3,1,1);
plot2d3('gnn',n,x2);
xtitle('Discreate Time sequence x[n] for a>0')
subplot(3,1,2);
a=gca();
a.y_location="origin";
a.x_location="origin";
plot2d(W,XW2_Phase);
title('Magnitude Response abs(X(jW))')
subplot(3,1,3);
a=gca();
a.y_location="origin";
a.x_location="origin";
plot2d(W,XW2_Phase);
```

title('Phase Response<(X(jW))')





3)

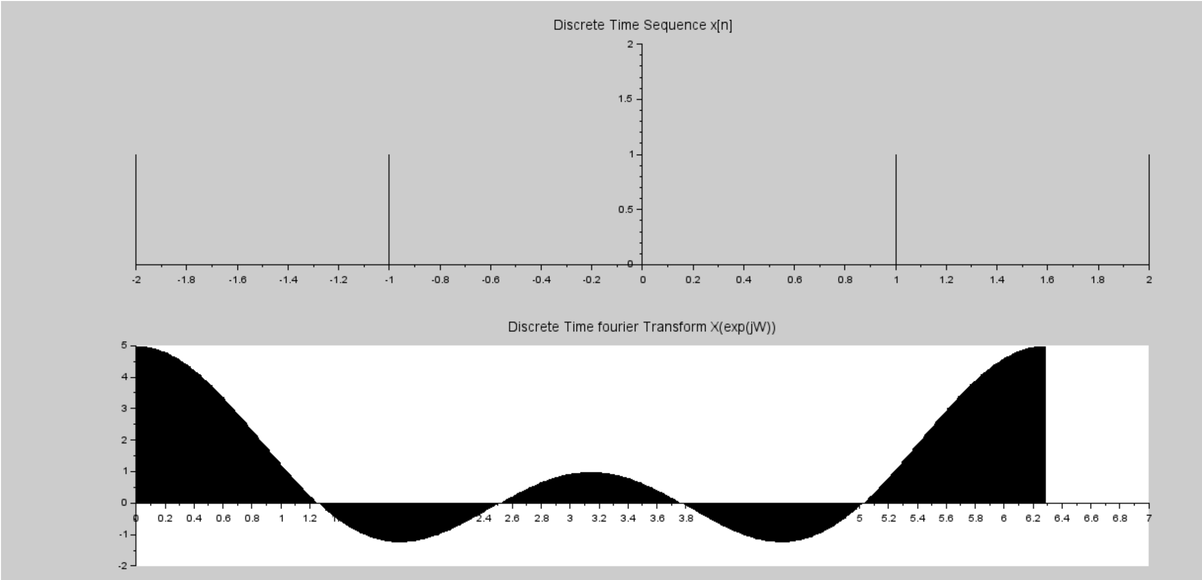
//discrete Time Fourier Transform of x[n]=1, abs(n)<=N1

clear;

clc;

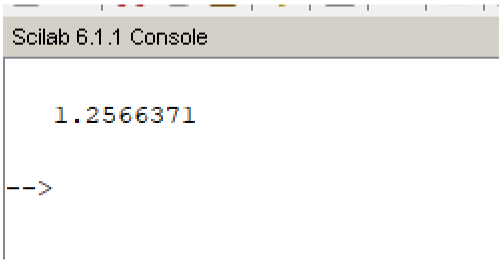
close;

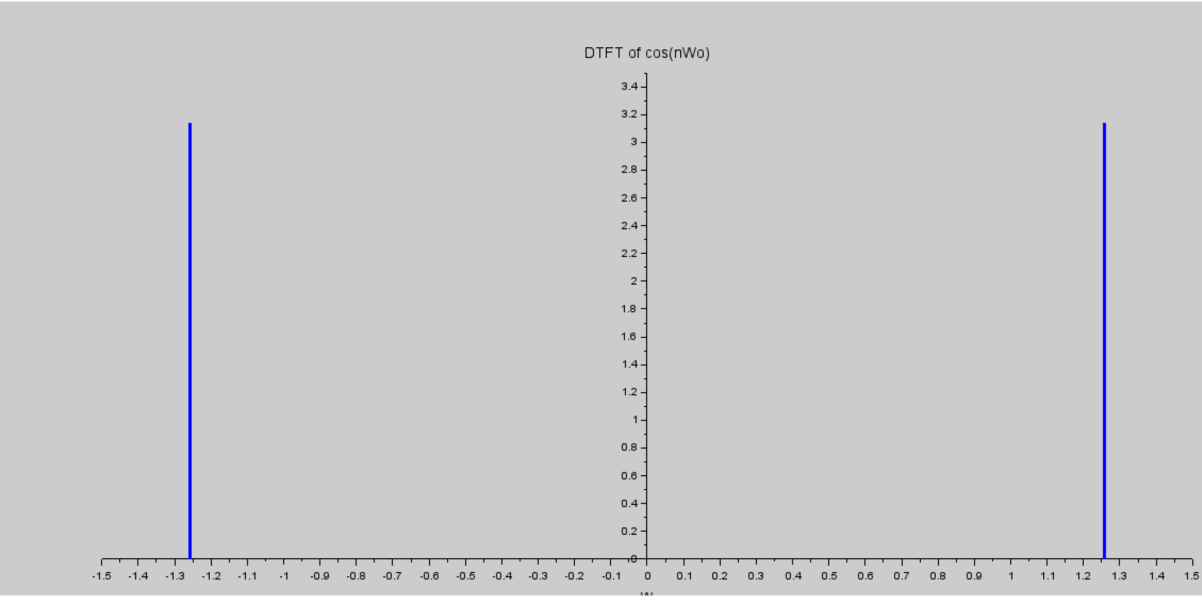
```
//DTS Signal
N1=2;
n=-N1:N1;
x=ones(1,length(n));
//Discrete-time Fourier Transform
Wmax=2*%pi;
K=4;
k=0:(K/1000):K;
W=k*Wmax/K
XW=x*exp(-sqrt(-1)*n'*W);
XW_Mag=real(XW);
//plot for abs(a)<1
figure
subplot(2,1,1);
a=gca();
a.y_location="origin";
a.x_location="origin";
plot2d3('gnn',n,x);
xtitle('Discrete Time Sequence x[n]')
subplot(2,1,2);
a=gca();
a.y_location="origin";
a.x_location="origin";
plot2d3(W,XW_Mag);
title('Discrete Time fourier Transform X(exp(jW))')
```



4)

```
//Discrete Time Fourier Transform :x[n]=cos(nWo)

clear;

clc;

close;

N=5;

Wo=2*%pi/N;

W=[-Wo,0,Wo];

XW=[%pi,0,%pi];

//

figure

a=gca();

a.y_location="origin";

a.x_location="origin";

plot2d3('gnn',W,XW,2);

poly1=a.children(1).children(1);

poly1.thickness=3;

xlabel('   W');

title('DTFT of cos(nWo)')

disp(Wo)
```





5)

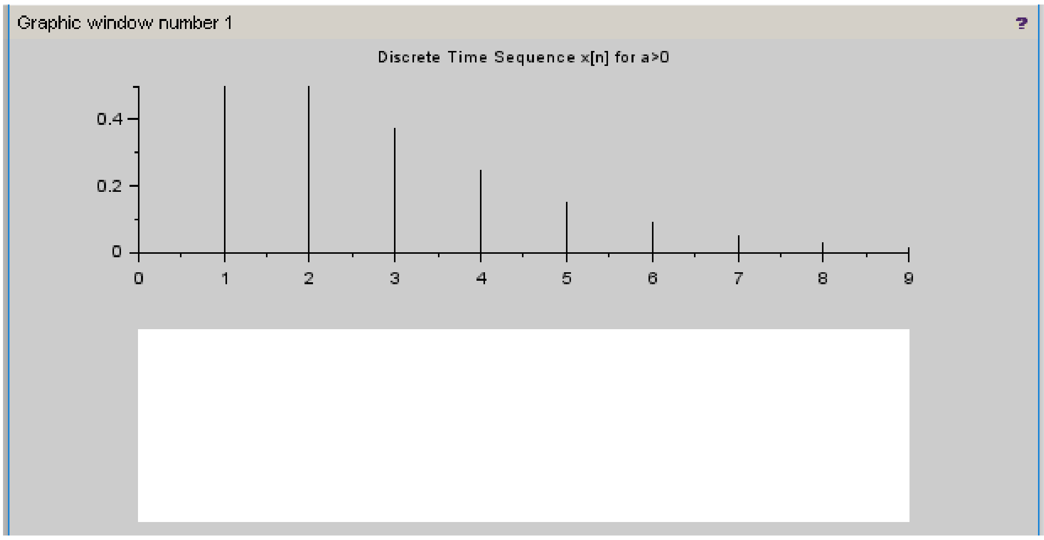
Discrete Time Fourier Transform of discrete sequence X[n]=(n)*(a^n).u[n]

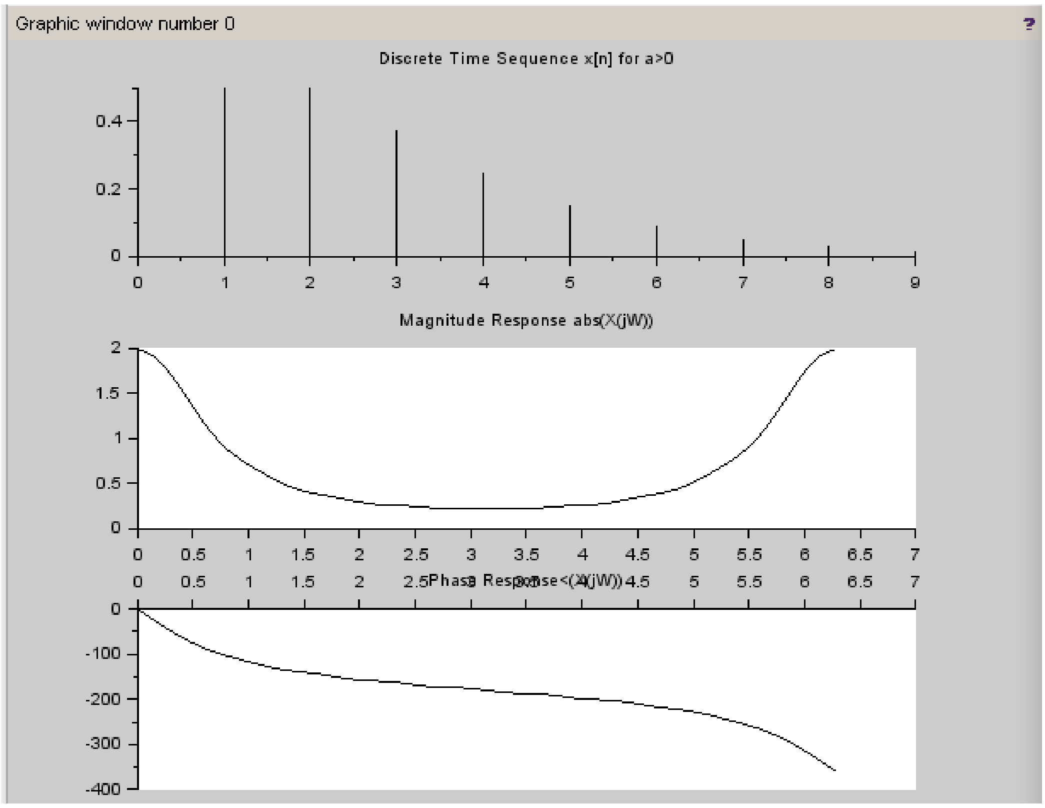
a>0 and a<0

```
clc;
close;
a1=0.5;
a2=0.5;
max_limit=10;
for n=0:max_limit-1
   x1(n+1)=(n)*(a1^n);
   x2(n+1)=(n)*(a2^n);
end
n=0:max_limit-1;
Wmax=2*%pi;
```

```
K=4;
k=0:(K/1000):K;
W=k*Wmax/K;
x1=x1';
x2=x2';
XW1=x1*exp(-sqrt(-1)*n'*W);
XW2=x2*exp(-sqrt(-1)*n'*W);
XW1_Mag=abs(XW1);
XW2_Mag=abs(XW2);
[XW1_Phase,db]=phasemag(XW1);
[XW2_Phase,db]=phasemag(XW2);
figure
subplot(3,1,1);
plot2d3('gnn',n,x1);
xtitle('Discrete Time Sequence x[n] for a>0')
subplot(3,1,2);
a=gca();
a.y_location="origin";
a.x_location="origin";
plot2d(W,XW1_Mag);
title('Magnitude Response abs(X(jW))')
subplot(3,1,3);
a=gca();
a.y_location="origin";
a.x_location="origin";
plot2d(W,XW1_Phase);
title('Phase Response<(X(jW))')
figure
subplot(3,1,1);
plot2d3('gnn',n,x2);
xtitle('Discrete Time Sequence x[n] for a>0')
```

subplot(3,1,2)


Graphic window number 1
Discrete Time Sequence x[n] for a>0
0.4
0.2
0
0 1 2 3 4 5 6 7 8 9


Graphic window number 0
Discrete Time Sequence x[n] for a>0
0.4
0.2
0
0 1 2 3 4 5 6 7 8 9
Magnitude Response abs(X(jW))
2
1.5
1
0.5
0
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7
Phase Response<(X(jW))
0
-100
-200
-300
-400

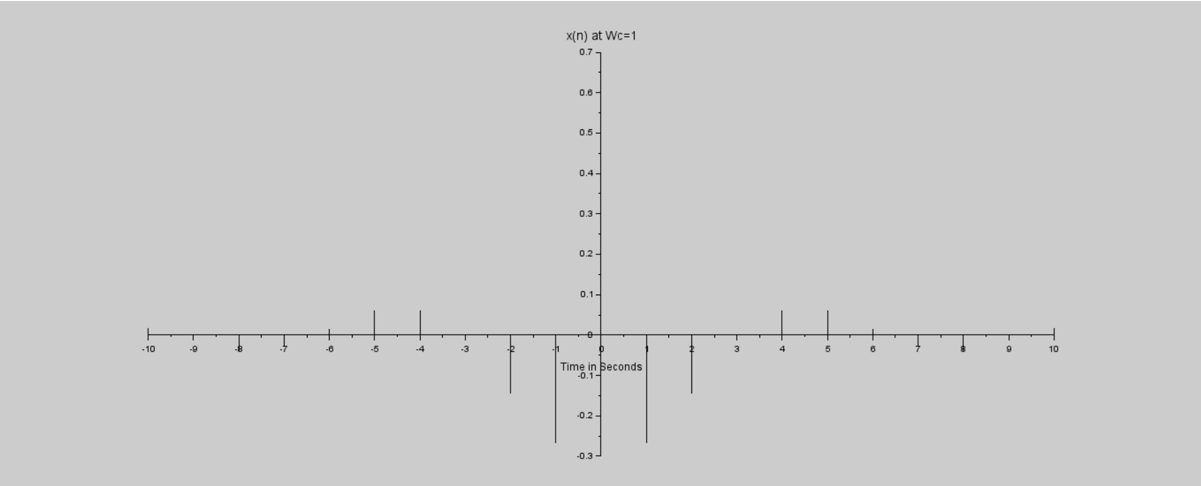
Practical 4D

Inverse DTFT

A]

```
clear;
clear;
clc;
wc=1;
y=1;
for n=-%pi:%pi/80:%pi
   if n<-wc | n>wc then
      X(1,y)=1;
      y=y+1;
   else X(1,y)=0;
      y=y+1;
   end
end
n=-%pi:%pi/80:%pi;
a=gca();
a.y_location="origin";
a.x_location="origin";
plot(n,X);
xlabel('Frequency in Radians/Seconds');
title('X(e^jw)) at w=1');
A=1%pi;
for k=-10:10
   x(k+11)=A*integrate('cos(w*k)','w',wc,%pi);
end
figure(1);
k=-10:10;
a=gca();
a.y_location="origin";
```

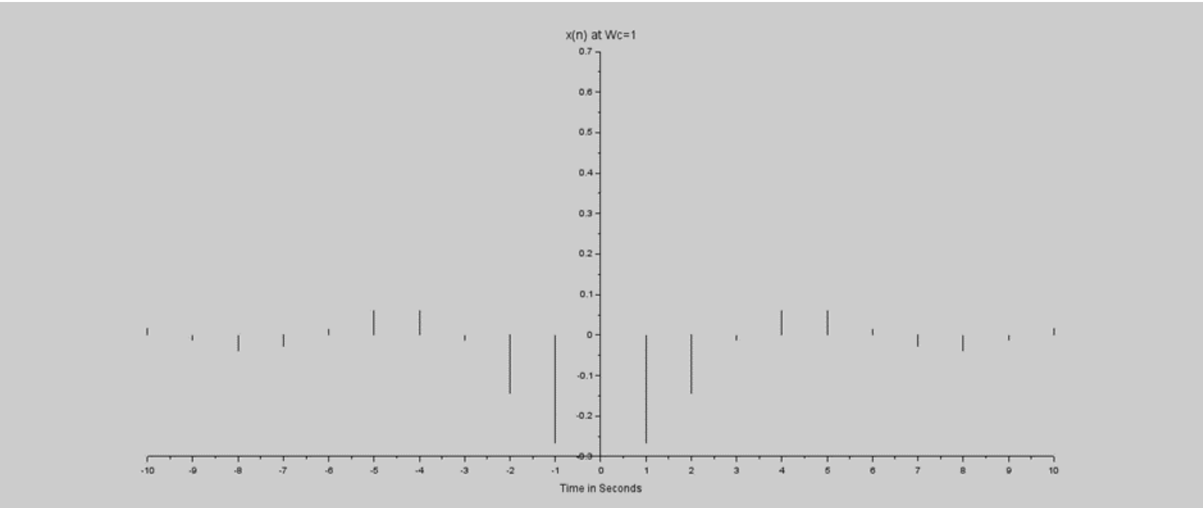
```
a.x_location="origin";

plot2d3(k,x);

xlabel('Time in Seconds');

title('x(n) at Wc=1');
```



B]

```
clear;

clear;

clc;

wc=1;

y=1;

for n=-%pi:%pi/80:%pi

   if n<-wc | n>wc then

      X(1,y)=1;

      y=y+1;

   else X(1,y)=0;

      y=y+1;

   end

end

n=-%pi:%pi/80:%pi;

a=gca();
```

```
a.y_location="origin";
a.x_location="origin";
plot(n,X);
xlabel('Frequency in Radians/Seconds');
title('X(e^gw)) at Wc=1');
A=1/%pi;
for k=-10:10
  x(k+11)=A*integrate('cos(w*k)','w',wc,%pi);
end
figure(1);
k=-10:10;
a=gca();
a.y_location="origin";
a.y_location="origin";
plot2d3(k,x);
xlabel('Time in Seconds');
title('x(n) at Wc=1')
```



Practical 5

Z transform

A)

```
clear;
//z transform of[2 -1 3 2 1 0 2 3 -1]
clear;
clc;
close;
function [za]=ztransfer(sequence, n)
   z=poly(0,'z','r')
   za=sequence*(1/z)^n'
endfunction
x1=[2 -1 3 2 1 0 2 3 -1]
n=-4:4
zz=ztransfer(x1,n);
//Display the result in command window
disp(zz,"Z-transform of sequence is:")
disp('ROC is the entire plane except z=0 amd z=%intf;')
```

```
 -1 +3z +2z^2 +z^4 +2z^5 +3z^6 -z^7 +2z^8
 ----------------------------------------
                  z^4

"Z-transform of sequence is:"

"ROC is the entire plane except z=0 amd z=%intf;"
```

B)

```
clear;
//Z transform of [1,2,3,4,5,6,7]
clc;
function [za]=ztransfer(sequence, n)
    z=poly(0,'z','r')
```

```
    za=sequence*(1/z)^n'
endfunction
x=[1,2,3,4,5,6,7];
n1=0:length(x)-1;
X=ztransfer(x,n1);
disp('X(z)=')
disp(X)
funcprot(0);
```

```
"X(z)="

  7 +6z +5z^2 +4z^3 +3z^4 +2z^5 +z^6
  ----------------------------------
                 z^6
```

C)

```
clear
//Z transform of [1,2,3,4,5,6,7] with different range
clc;
function [za]=ztransfer(sequence, n)
   z=poly(0,'z','r')
   za=sequence*(1/z)^n'
endfunction
x=[1,2,3,4,5,6,7]
n1=-2:length(x)-3
X=ztransfer(x,n1)
disp(X,'X(z)=')
funcprot(0);
```

```
  7 +6z +5z^2 +4z^3 +3z^4 +2z^5 +z^6
  ----------------------------------
                 z^4

 "X(z)="
```

D)

```
clear;
```

//Z-transform of[1,2,3,4,5,0,7]

```
clc;
function [za]=ztransfer(sequence, n)
   z=poly(0,'z','r')
   za=sequence*(1/z)^n'
endfunction
x=[1,2,3,4,5,0,7]
n1=0:length(x)-1;
X=ztransfer(x,n1)
disp(X);
funcprot(0);
```

```
7 +5z^2 +4z^3 +3z^4 +2z^5 +z^6
-------------------------------
              z^6
```

E)

//Z transform of [4,2,-1,0,3,-4]

```
clc;
function [za]=ztransfer(sequence, n)
   z=poly(0,'z','r')
   za=sequence*(1/z)^n'
endfunction
x=[4,2,-1,0,3,-4]
n1=-2:length(x)-3
X=ztransfer(x,n1);
disp(X,'X(z)=');
funcprot(0);
```

```
 -4 +3z -z^3 +2z^4 +4z^5
 -----------------------
           z^3

"X(z)="
```

F)

```
//Convolution of two signals x1 and x2
clc;
function [za]=ztransfer(sequence, n)
   z=poly(0,'z','r')
   za=sequence*(1/z)^n'
endfunction;
x1=[1,-3,2];
n1=0:length(x1)-1;
X1=ztransfer(x1,n1);
x2=[1,2,1];
n2=0:length(x2)-1;
X2=ztransfer(x2,n2);
X=X1*X2;
disp(X,'X(z)=');
z=poly(0,'z');
X=[1;-z^-1;-3*z^-2;z^-3;2*z^-4];
n=0:4;
Z1=z^n';
x=(X.*Z1);
disp(x,'x[n]=');
```

```
 2 +z -3z^2 -z^3 +z^4
 --------------------
         z^4

"X(z)="

 1
 -
 1

 -1
 --
 1

 -3
 --
 1

 1
 -
 1

 2
 -
 1

"x[n]="
```

Practical 5 B

Inverse Z-Transform

A]

```
clear;
//Find the inverse Z-transform using long divison method
clc;
clear;
z=poly(0,'z')
x=ldiv(z^3-10*z^2-4*z+4,2*z^2-2*z-4,4);
disp(x,'x[n]=');
```

```
  0.5
 -4.5
 -5.5
 -12.5

 "x[n]="
```

B]

```
clear
//Find the inverse Z-transform
clc;
clear;
z=poly(0,'z');
x=ldiv((z+1),(z-1/3),4);
disp(x,'x[n]=');
```

```
 1.
 1.3333333
 0.4444444
 0.1481481

"x[n]="
```

C]

```
clear;
//Inverse Z-transform using long division method
clc;
clear;
z=poly(0,'z');
x=ldiv(z,(z-0.5),4);
disp(x,'x[n]=');
```

```
  1.
  0.5
  0.25
  0.125

 "x[n]="
```

D]clear

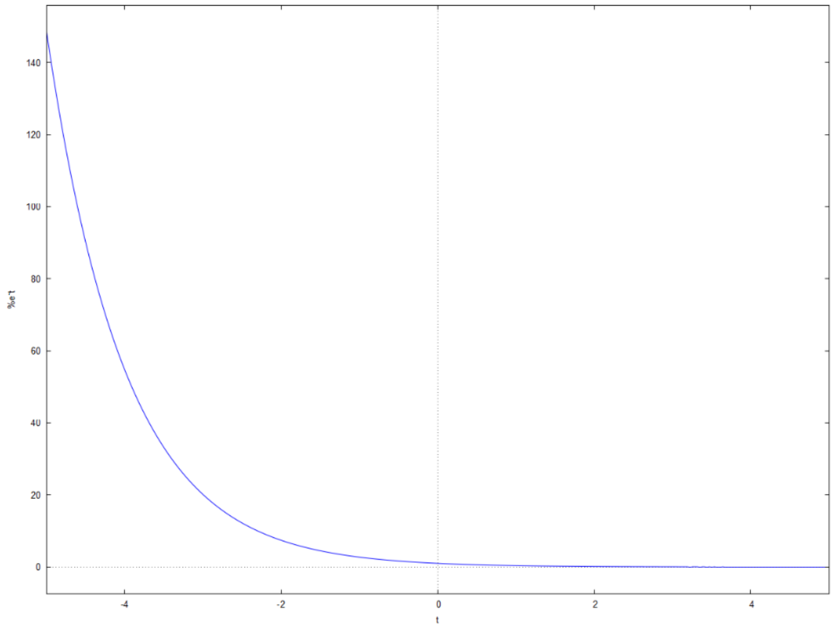
```
//To find input x(n)
//X(z)=1/(2*z^(-2)+2*z^(-1)+1);
clear;
clc;
close;
z=%z;
a=(2+2*z+z^2);
b=z^2;
h=ldiv(b,a,6);
disp(h,"First six values of h(n)=")
```

```
  1.
 -2.
  2.
  0.
 -4.
  8.

 "First six values of h(n)="
```

Practical 6

A] Y=e^(-t)

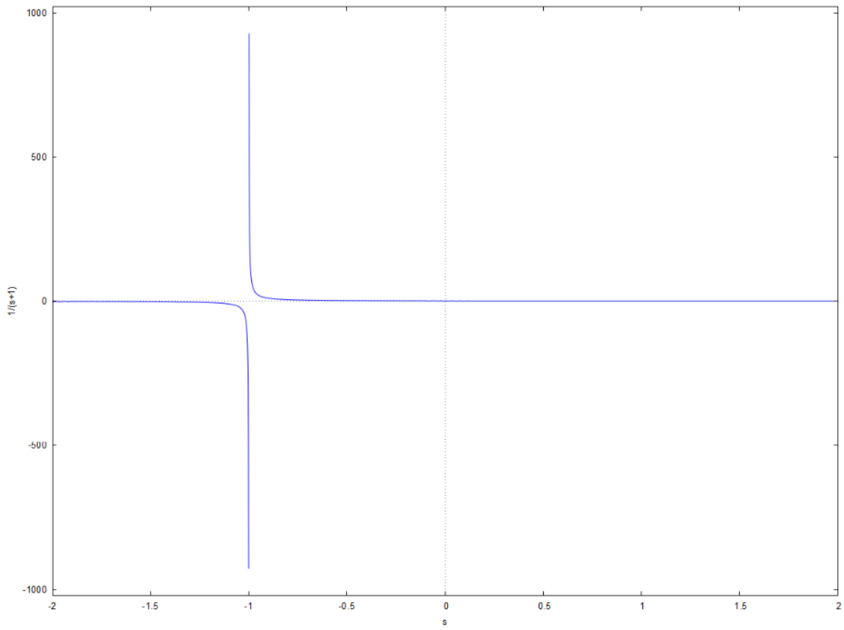
wxplot2d([%e^(-t)], [t,-5,5])$



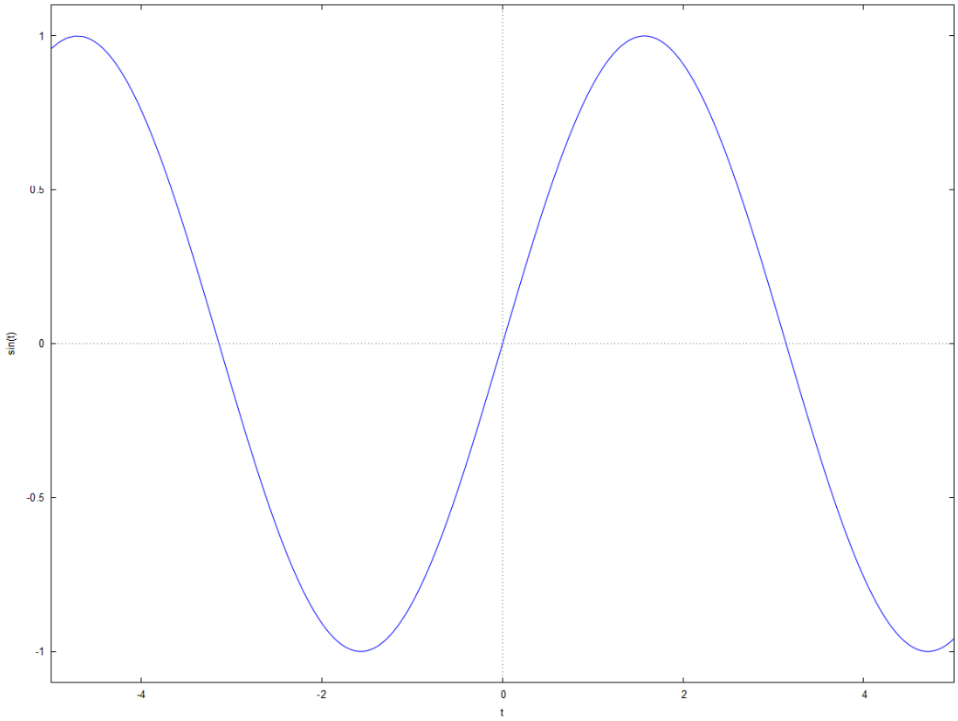
Laplace:

laplace(%e^(-t),t,s);

$$\frac{1}{s+1}$$

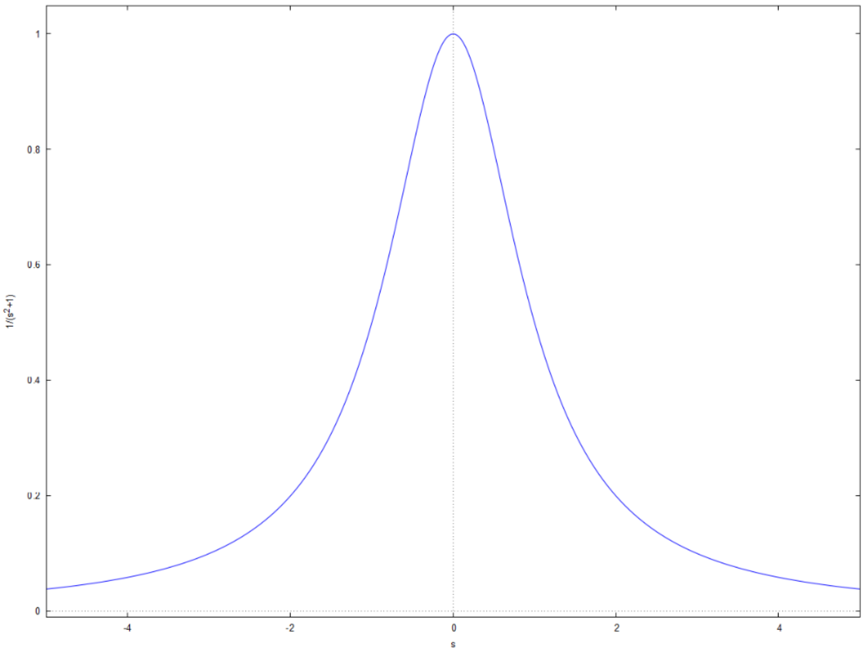


B) sint

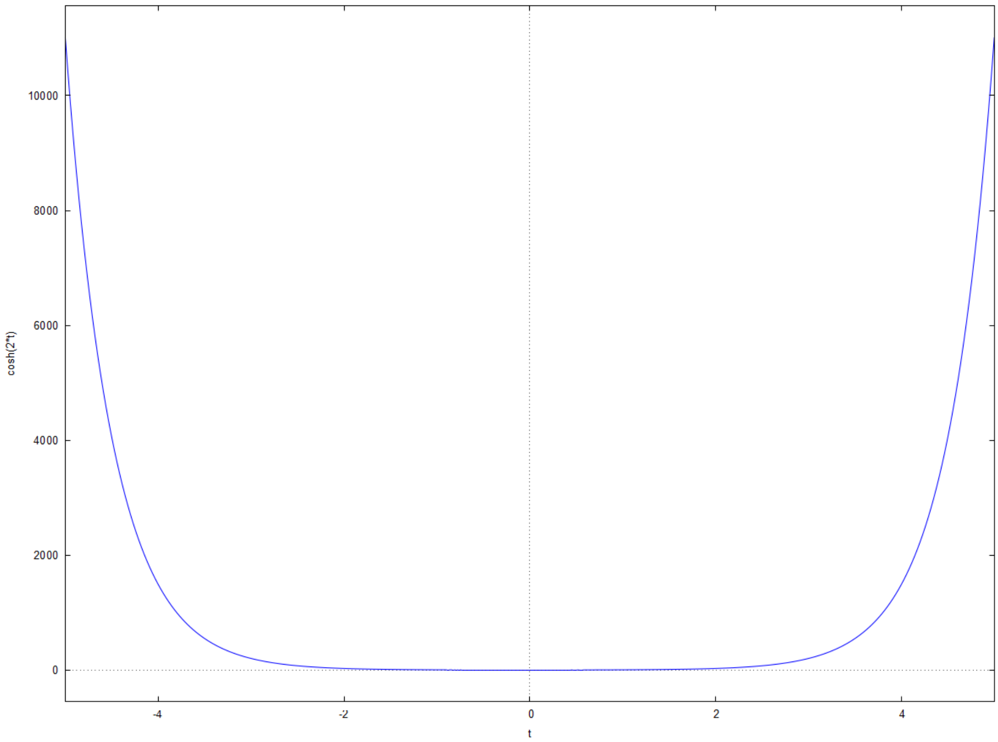


Laplace:

$$\frac{1}{s^2+1}$$

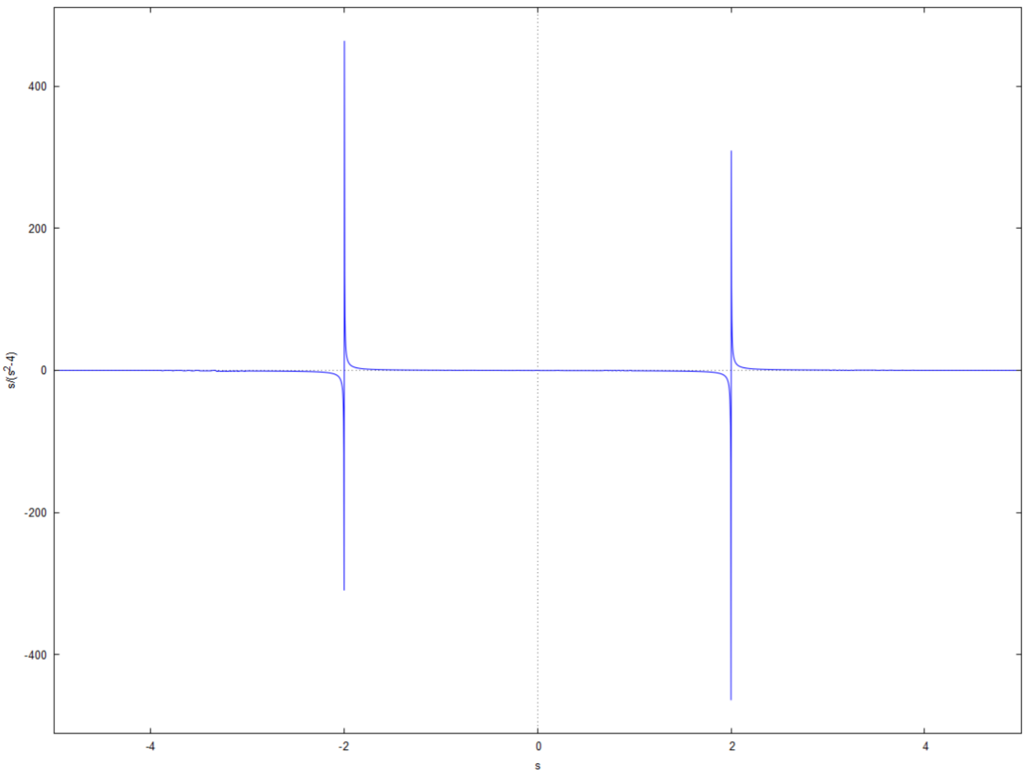


C) cosh2t:

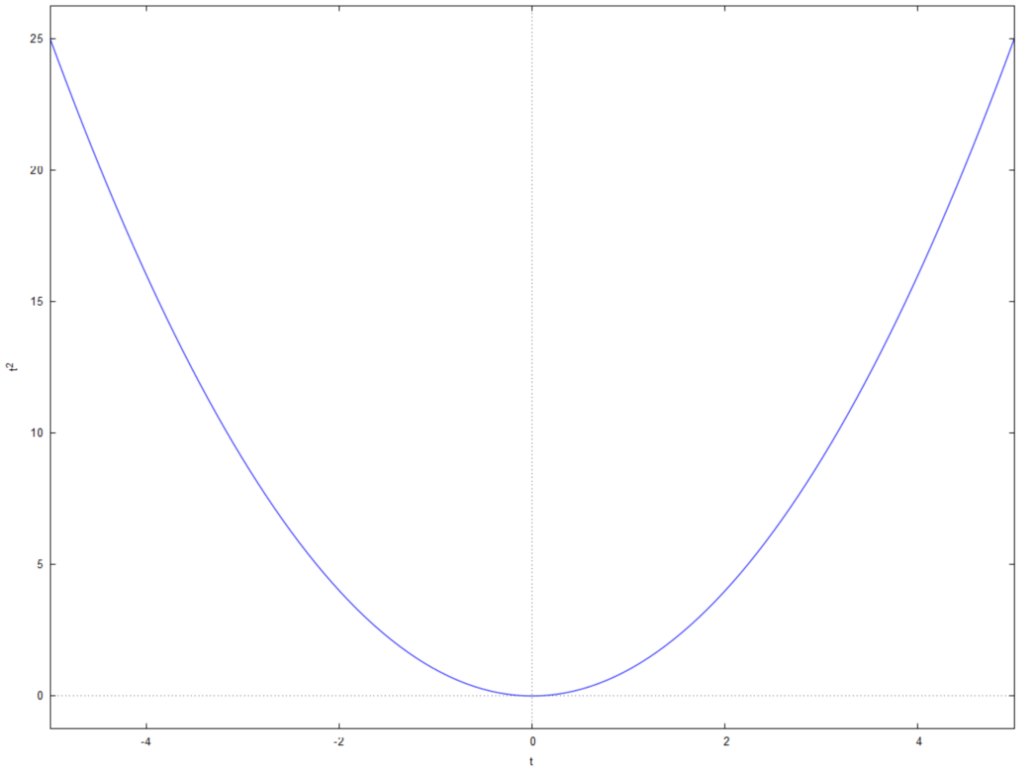


Laplace:

$$\frac{s}{s^2 - 4}$$

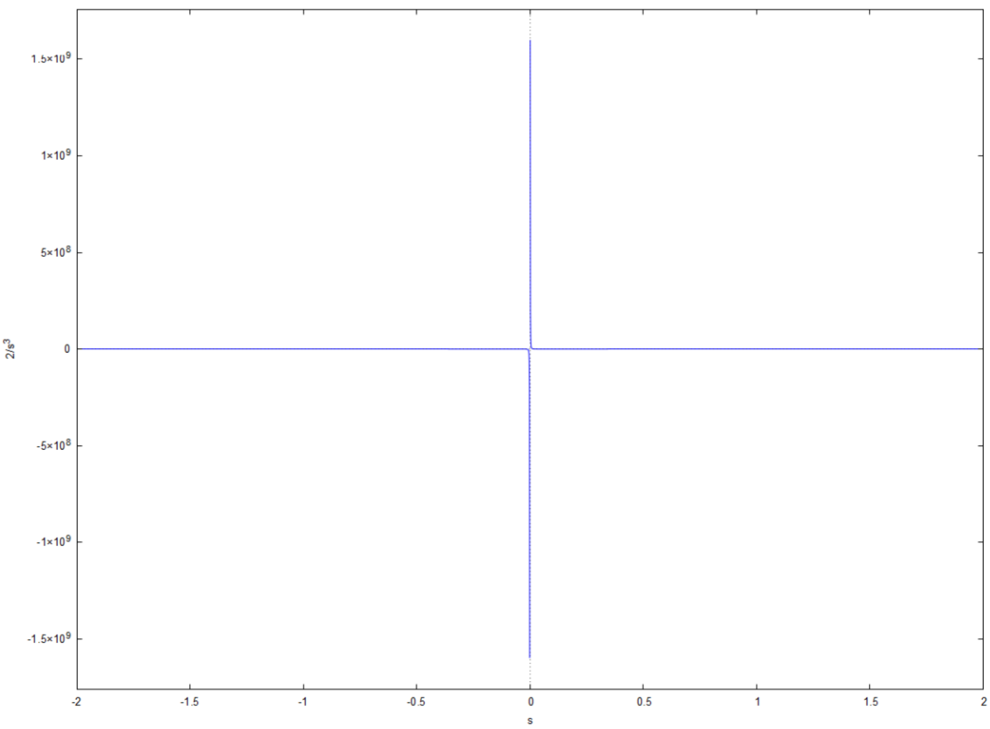


D) t^2:

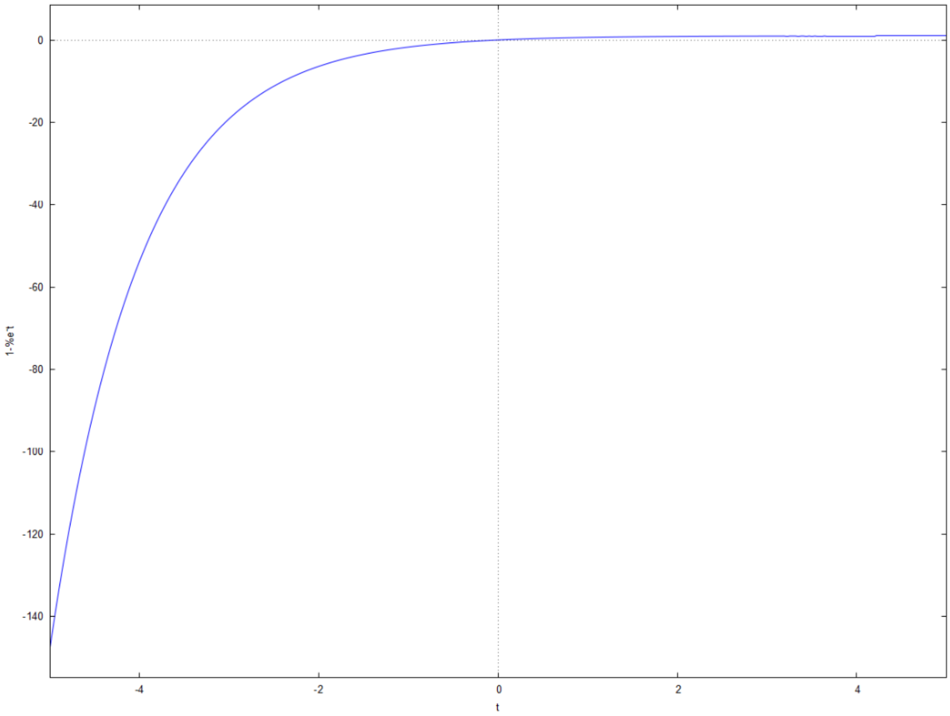


Laplace:

$$\frac{2}{s^3}$$

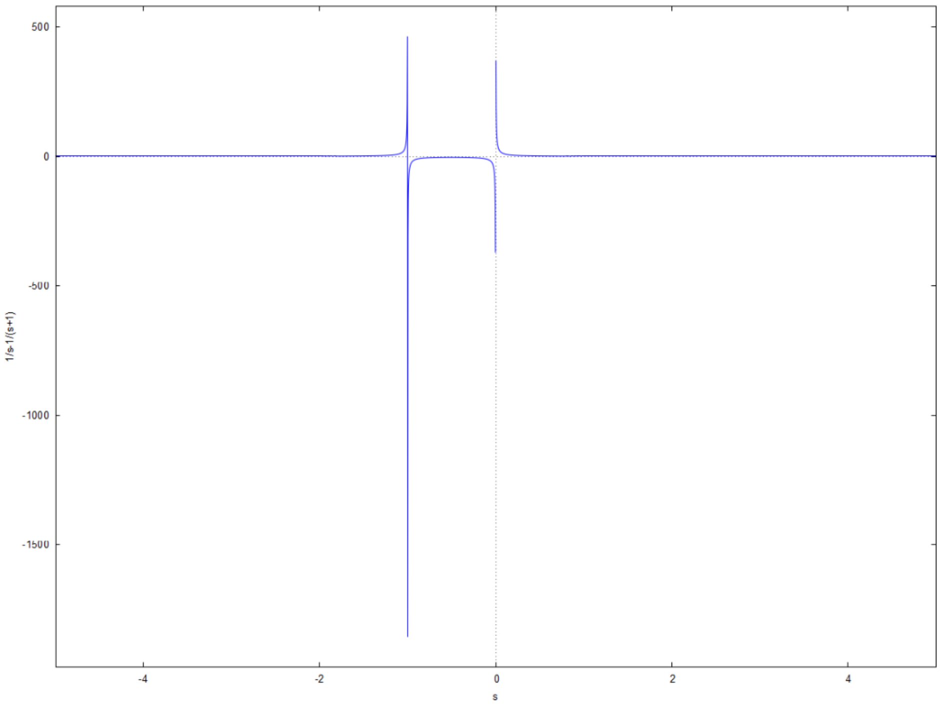


E) 1- e^(-t)

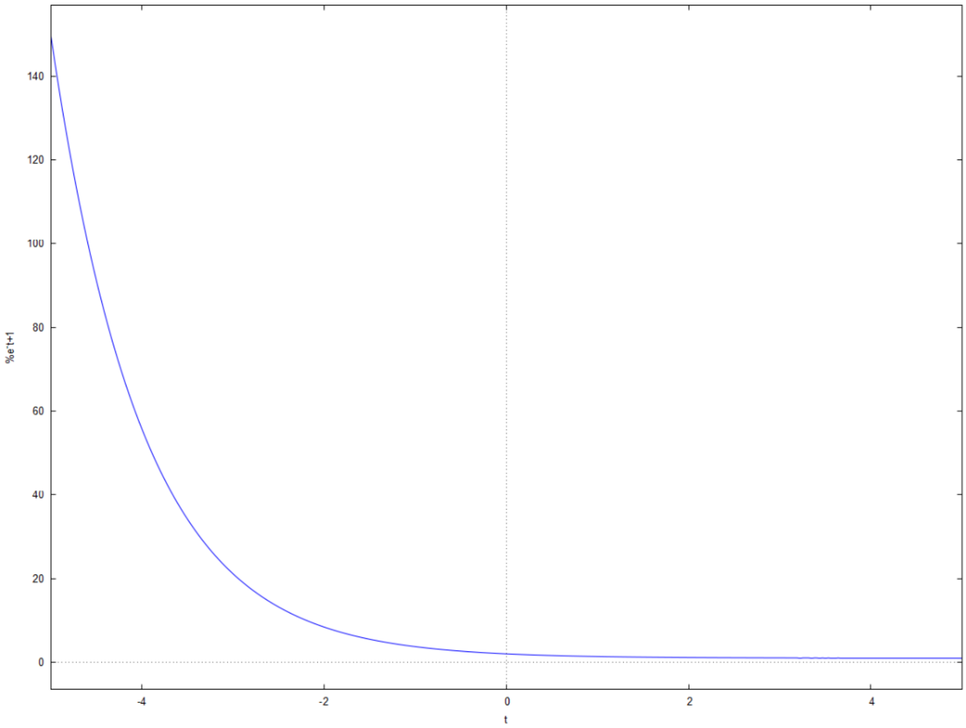


Laplace:

$$\frac{1}{s} - \frac{1}{s+1}$$

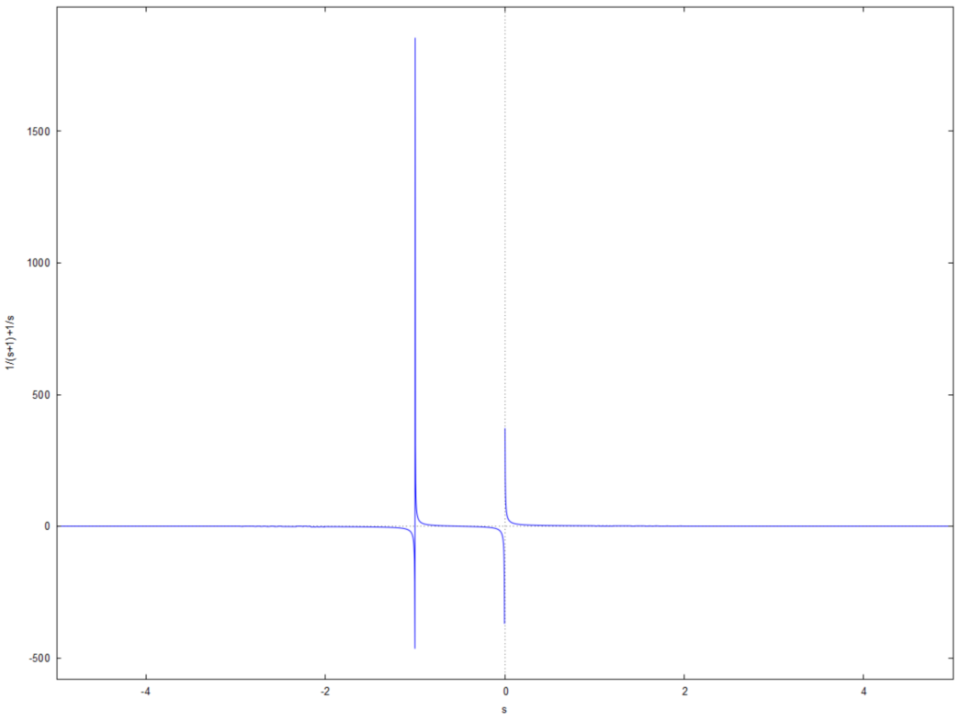


F)1+e^(-t):



Laplace:

$$\frac{1}{s+1}+\frac{1}{s}$$



Practical 7

System response using Laplace Transform

A] clear;

clc;

clear;

close;

s=poly(0,'s')

N=(s+1)*(s+3);

D=(s+2)*(s+4);

F=N/D;

disp(F,'Given Transfer Function:');

zero=roots(N);

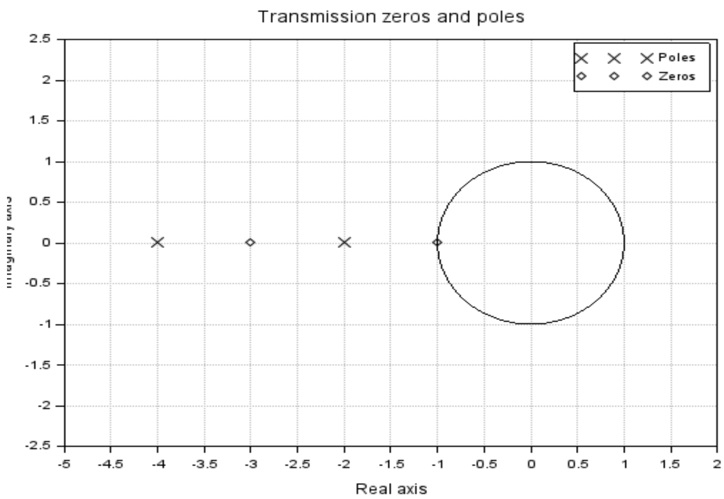
pole=roots(D);

disp(zero,'Zeros of transfer function:');

disp(pole,'Poles of transfer function:');

plzr(F)

```
 3 +4s +s^2
 ----------
 8 +6s +s^2

"Given Transfer Function:"

-3. + 0.i
-1. + 0.i

"Zeros of transfer function:"

-4. + 0.i
-2. + 0.i

"Poles of transfer function:"
```



B] clear;

clc;

clear;

close;

s=poly(0,'s');

l=3*s/(s+2)/(s+4)

disp(l,'Given Transfer Function:');

zero=roots(3*s);

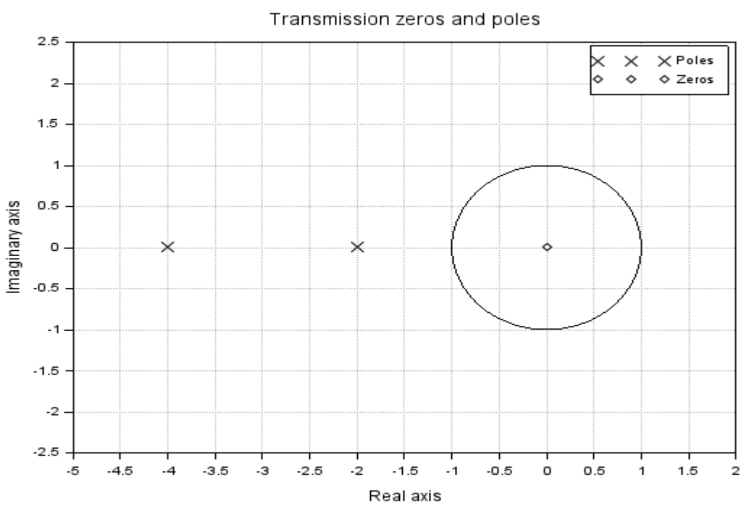
pole=roots((s+2)*(s+4));

disp(zero,'Zeros of transfer function:');

disp(pole,'Poles of transfer function:');

plzr(l)

```
    3s
----------
8 +6s +s^2

"Given Transfer Function:"

 0.

"Zeros of transfer function:"

-4. + 0.i
-2. + 0.i

"Poles of transfer function:"
```



C] clear;

clc;

clear;

close;

s=poly(0,'s')

F=10*s/(s^2+2*s+2);

disp(F,'Given Transfer Function:');

zero=roots(10*s);

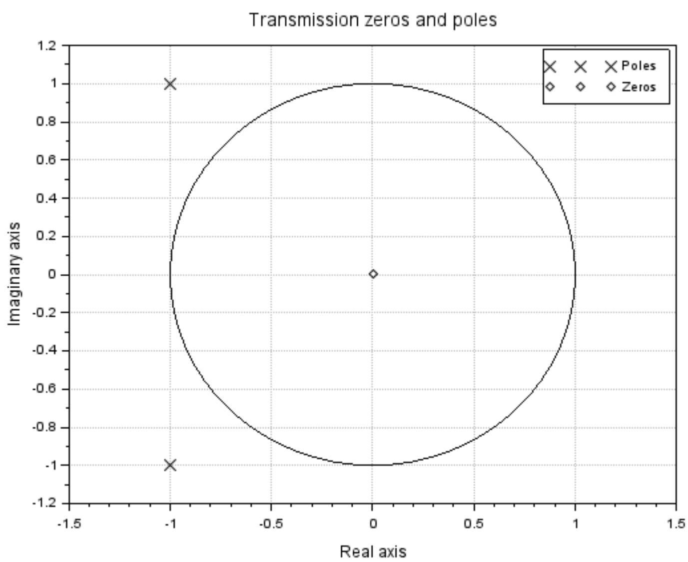
pole=roots(s^2+2*s+2);

disp(zero,'Zeros of transfer function:');

disp(pole,'Poles of transfer function:');

plzr(F)

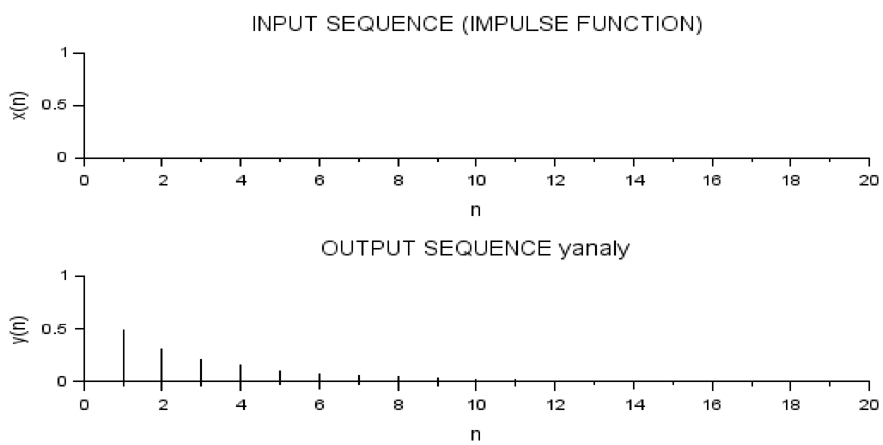
```
      10s
   ----------
   2 +2s +s^2

  "Given Transfer Function:"

   0.

  "Zeros of transfer function:"

  -1. + 1.i
  -1. - 1.i

  "Poles of transfer function:"
```



Practical 8

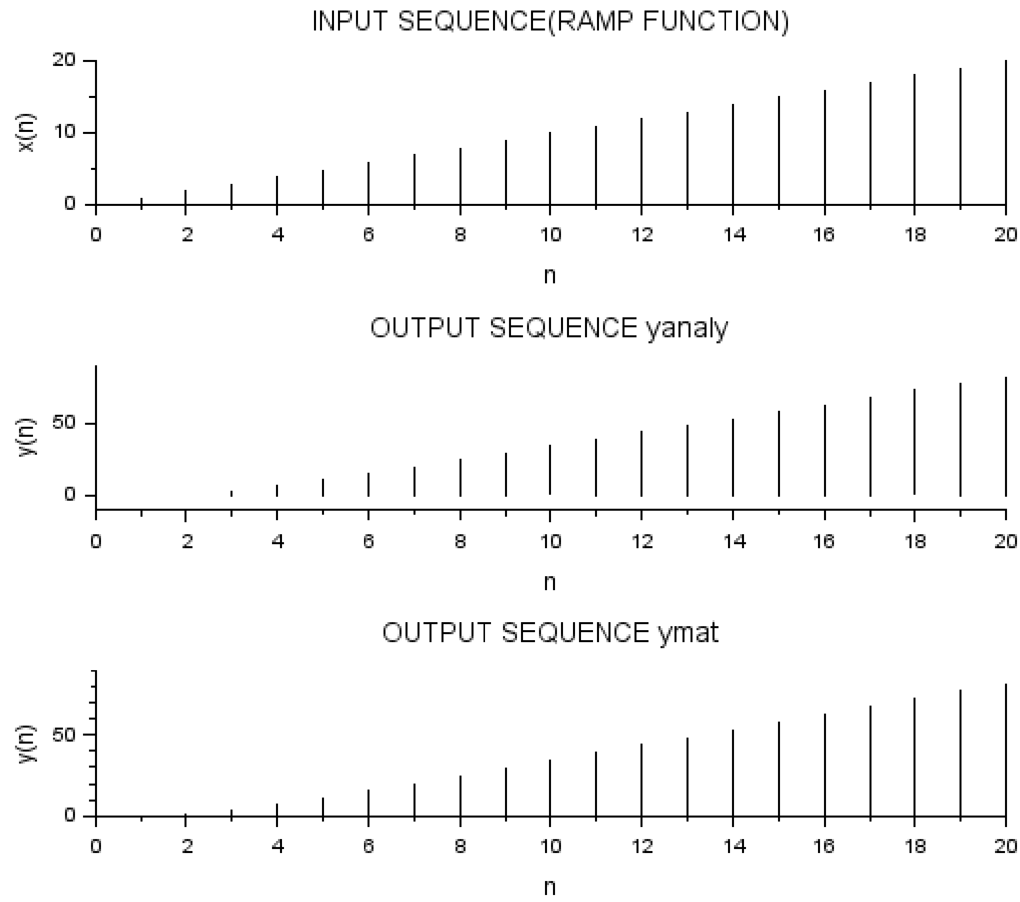
A]*//To plot the response of the system analytically and using scilab*

```
clear;
clc;
close;
n=0:1:20;
x=[1 zeros(1,20)];
b=[1 -0.5];
a=[1 -1 3/16];
yanaly=0.5*(0.75).^n+0.5*(0.25).^n; //Analytical Solution
ymat=filter(b,a,x);
subplot(3,1,1);
plot2d3(n,x);
xlabel('n');
ylabel('x(n)');
title('INPUT SEQUENCE (IMPULSE FUNCTION)');
subplot(3,1,2);
plot2d3(n,yanaly);
xlabel('n');
ylabel('y(n)');
title('OUTPUT SEQUENCE yanaly');
```



B]*//To plot the response of system analytically and using scilab*

```
clear;
clc;
close;
n=0:1:20;
x=n;
b=[0 1 1];
a=[1 -0.7 0.12];
yanaly=38.89*(0.4).^n-26.53*(0.3).^n-12.36+4.76*n;  //Analytical Solution
ymat=filter(b,a,x);
subplot(3,1,1);
plot2d3(n,x);
xlabel('n');
ylabel('x(n)');
title('INPUT SEQUENCE(RAMP FUNCTION)');
subplot(3,1,2);
plot2d3(n,yanaly);
xlabel('n');
ylabel('y(n)');
title('OUTPUT SEQUENCE yanaly');
subplot(3,1,3);
plot2d3(n,ymat);
xlabel('n');
ylabel('y(n)');
title('OUTPUT SEQUENCE ymat');
```



C]

//To plot the response of system analytically and using scilab

clear;

clc;

close;

n=0:1:20;

x=ones(1,length(n));

b=[0 1];

a=[1 -1 -1];

yanaly=0.447*(1.618).^n-0.447*(-0.618).^n;*//Analytical Solution*

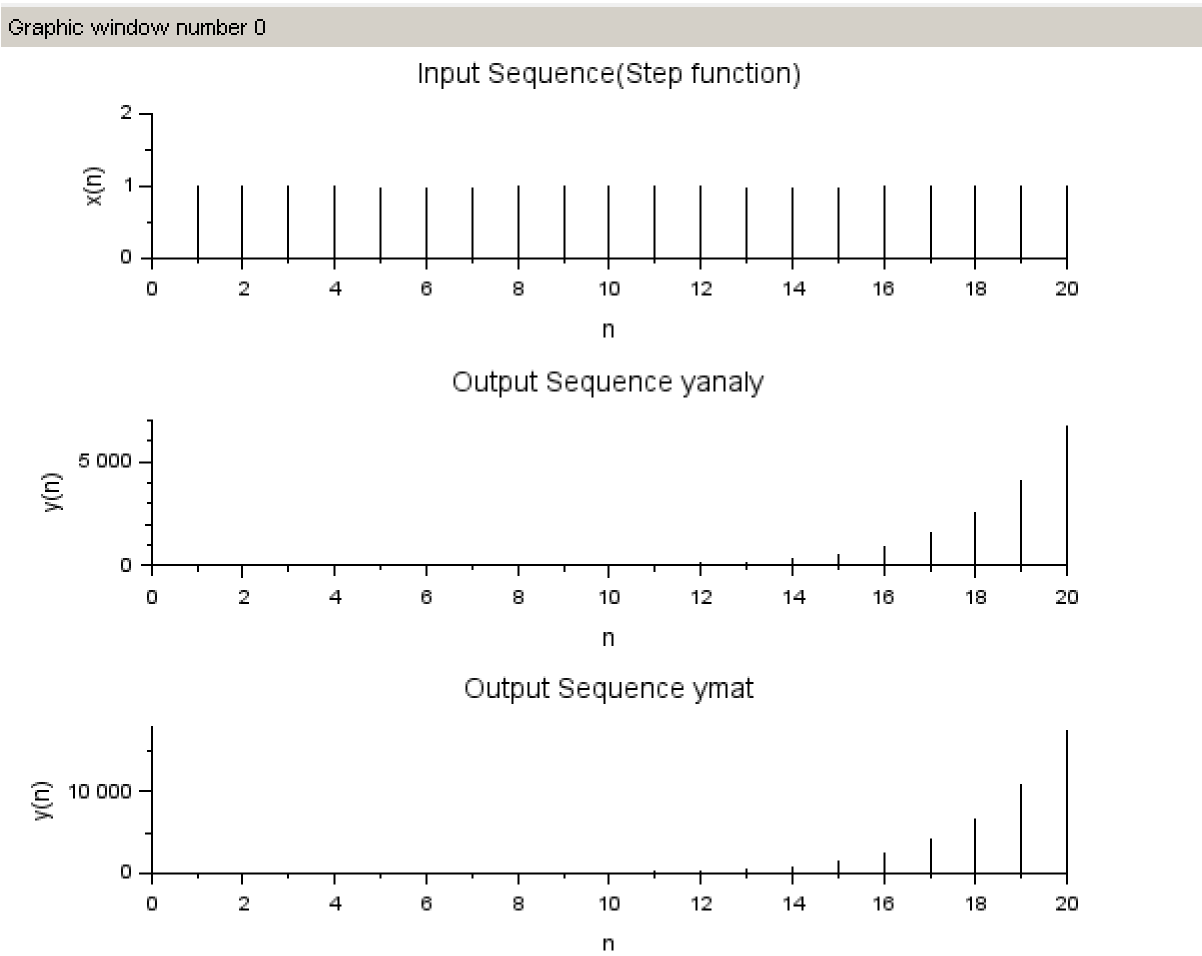
[ymat,zf]=filter(b,a,x);

subplot(3,1,1);

plot2d3(n,x);

xlabel('n');

```
ylabel('x(n)');
title('Input Sequence(Step function)');
subplot(3,1,2);
plot2d3(n,yanaly);
xlabel('n');
ylabel('y(n)');
title('Output Sequence yanaly');
subplot(3,1,3);
plot2d3(n,ymat,zf);
xlabel('n');
ylabel('y(n)');
title('Output Sequence ymat')
```



D]

```
clear;
//To find input h(n)
//X(z)=(z+0.2)/((z+0.5)(z-1))
clear;
clc;
close;
z=%z;
a=(z+0.5)*(z-1);
b=z+0.2;
h=ldiv(b,a,4);
disp(h,"h(n)=")
```

```
  1.
  0.7
  0.85
  0.7750000

 "h(n)="
```