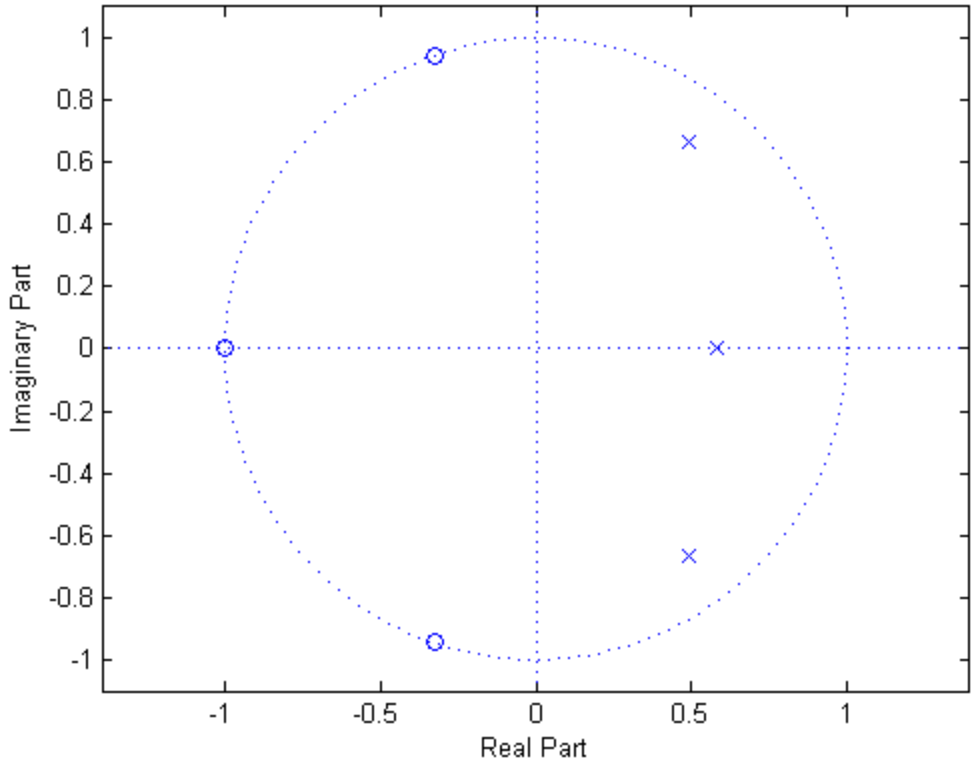
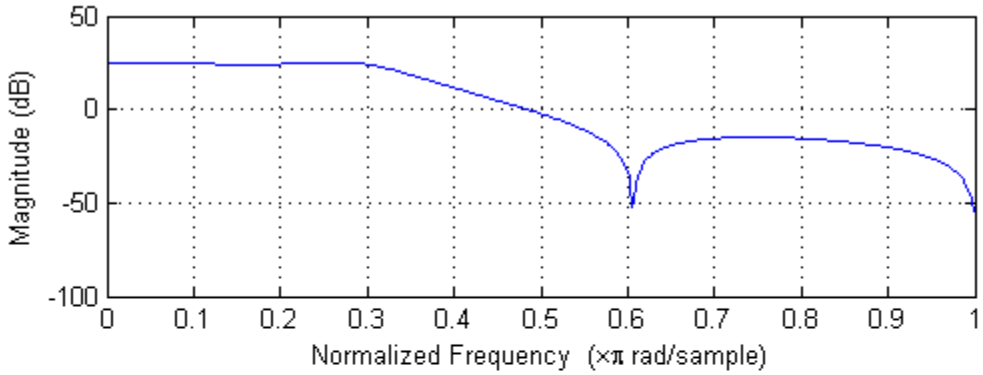
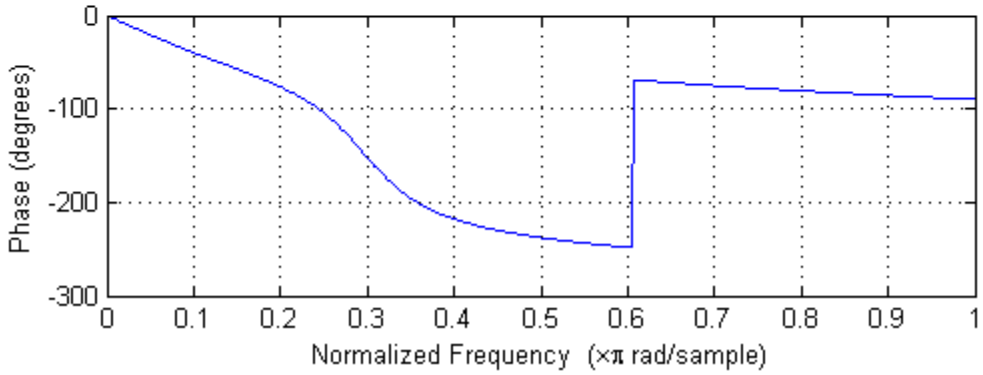
Question 1:

```
rand('seed',72);

z=[1 1.655 1.655 1];
p=[1 -1.57 1.264 -0.4];

z1=roots(z);
p1=roots(p);

figure(1);
        zplane(z1,p1);
figure(2);
        freqz(z,p);
```


Imaginary Part
Real Part
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1
-0.5
0
0.5
1


Magnitude (dB)
Normalized Frequency (×π rad/sample)
50
0
-50
-100
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1


Phase (degrees)
Normalized Frequency (×π rad/sample)
0
-100
-200
-300
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

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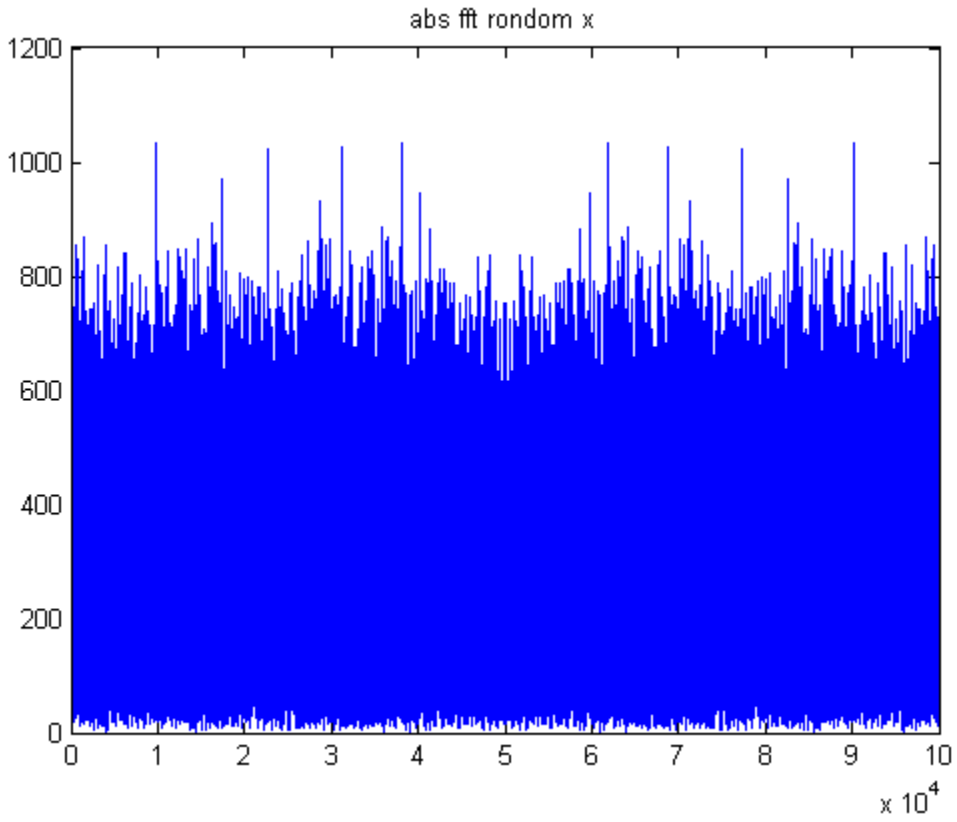
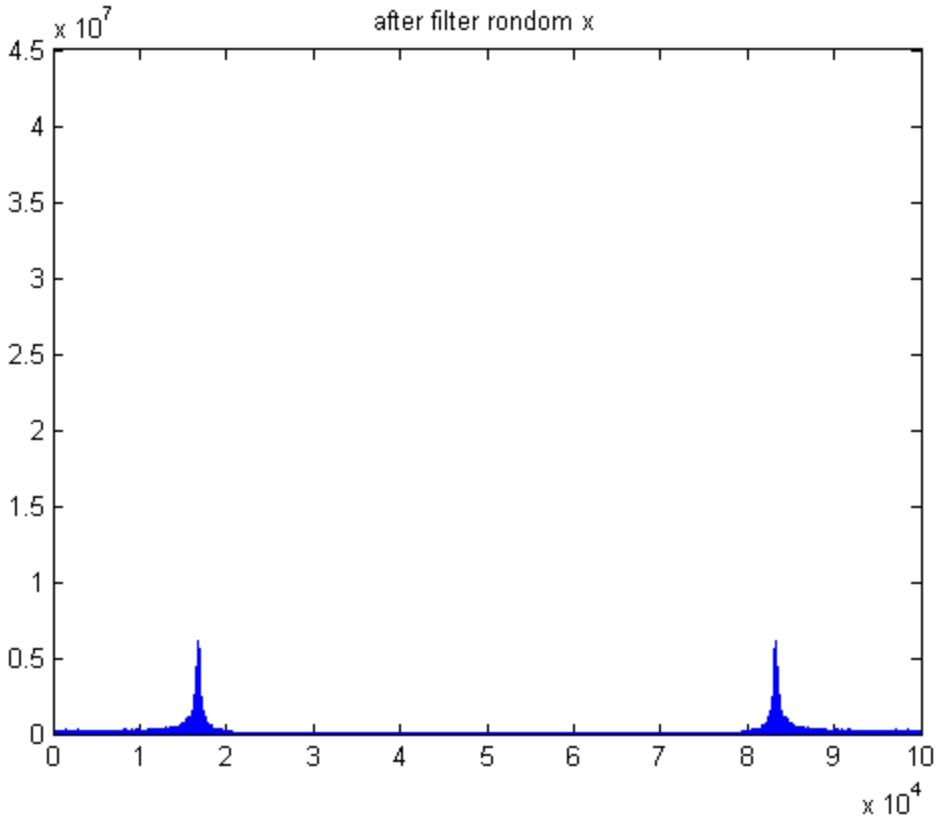
Question 2:

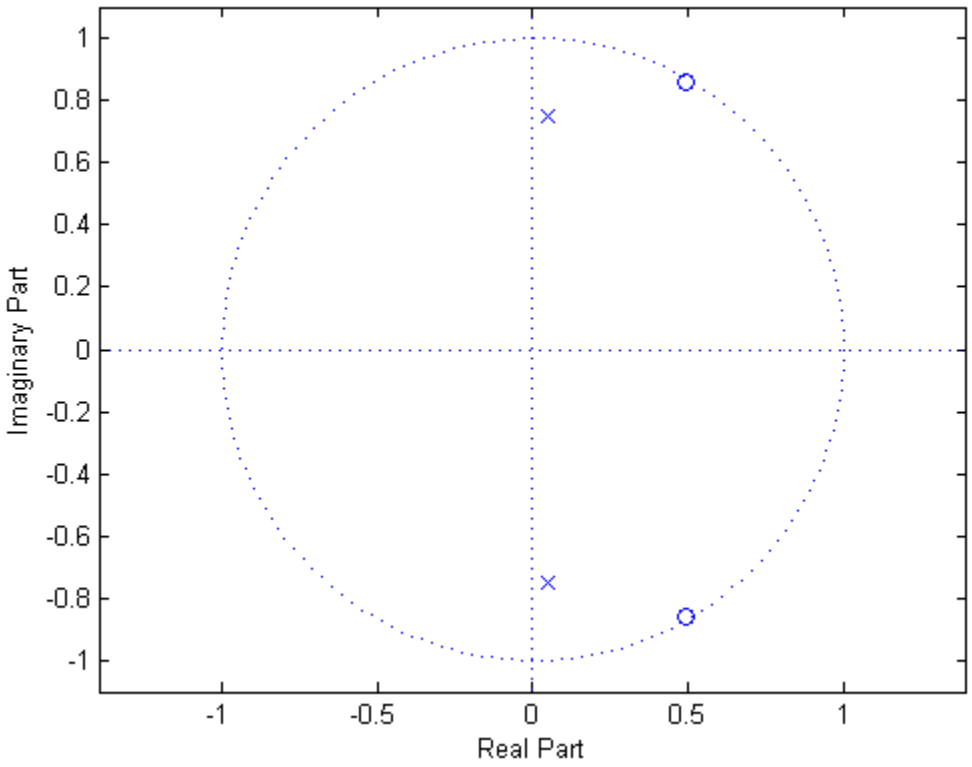
```
rand('seed',72);

%%noise before fillter

n=wgn(1,100000,0);

a=[1 -0.99 0.9801]
b=[1 -0.1 0.56]


x=abs(fft(n));

figure(1);
plot(x)
title('abs fft rondom x')
```

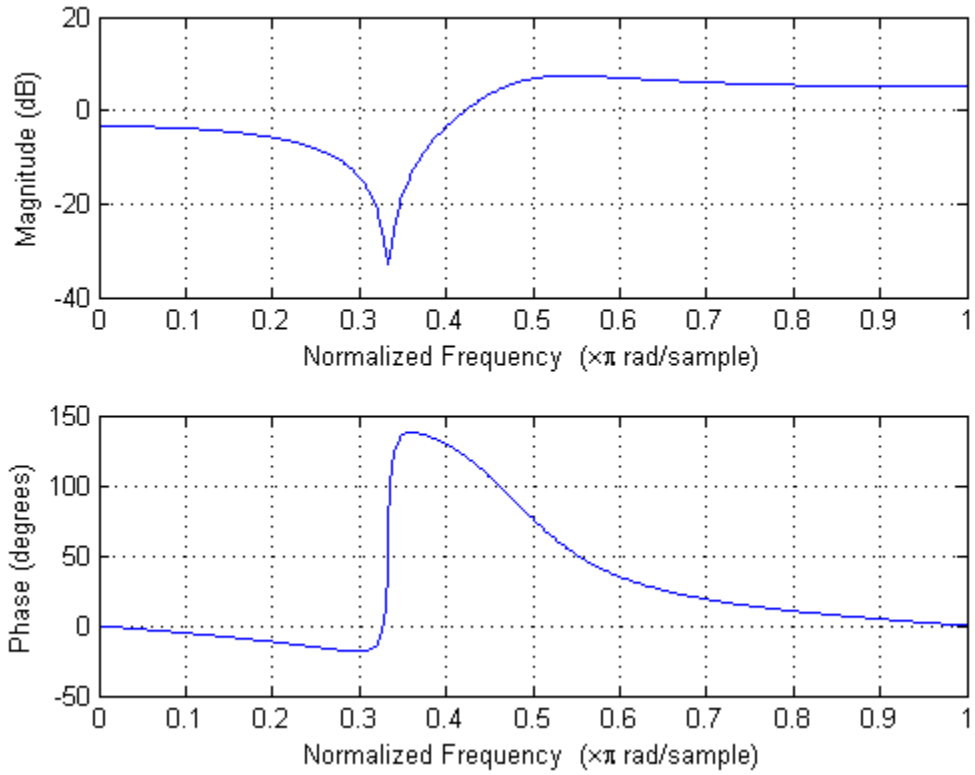



```
%%noise after fillter
x_filter = filter(b,a,x);
x_filter_abs= abs(fft(x_filter));

figure(2);
```

```
plot(x_filter_abs)
title('after filter rondom x')

z1=roots(a);
p1=roots(b);

figure(3);
        zplane(z1,p1);
figure(4);
        freqz(a,b);

fs=44100;
%  sound(x,fs);

sound(x_filter_abs,fs);
```


after filter rondom x
x 10^7
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0 1 2 3 4 5 6 7 8 9 10
x 10^4


Imaginary Part
Real Part
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1 -0.5 0 0.5 1



question 3

system is not stable as the poles on the right side in the z plane
the system is causal : as it can't predict y(n+1) as it dependents on y(n)

```
rand('seed',72);

n=100;
```

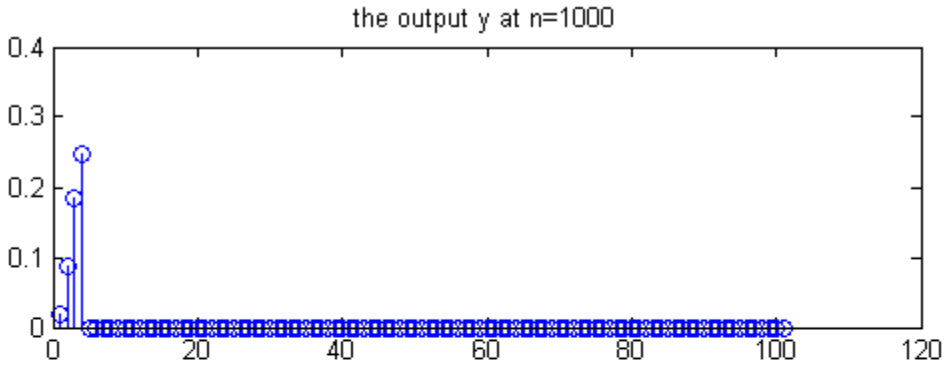
question 3

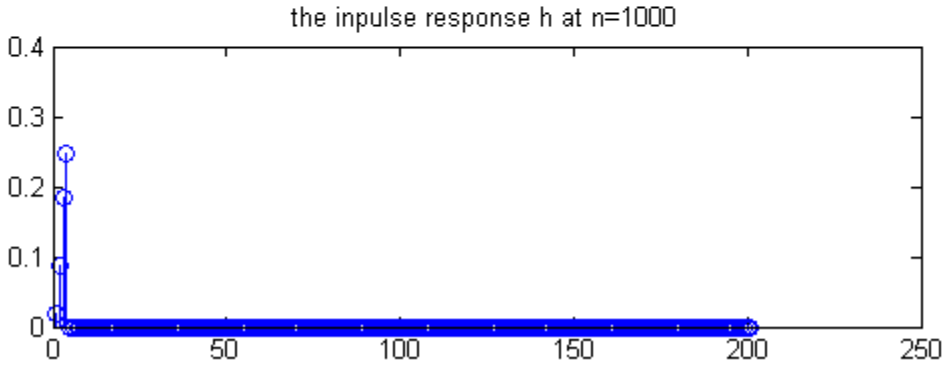
```
x=[1 zeros(1,n)];

yn=[zeros(1,n+1)];



yn(1)=0.0181;
```

```
yn(2)=0.0543+1.76*yn(1);

yn(3)=0.0543+1.76*yn(2)-1.1829*yn(1);

yn(4)=0.0181+1.76*yn(3)-1.1829*yn(2)+0.2781*yn(1);



for index=5:length(n)

    yn(index)=0.0181*x(index)+0.0543*x(index-1)+0.0543*x(index-3)+1.76*yn(index-1)-
1.1829*yn(index-2)+0.2781*yn(index-3);
end
h=conv(x,yn);
```

plot impulse response

```
figure(1)

subplot(2,1,1)

stem(yn)

title('the output y at n=1000')

subplot(2,1,2)
stem(h)
title('the inpulse response h at n=1000')
```



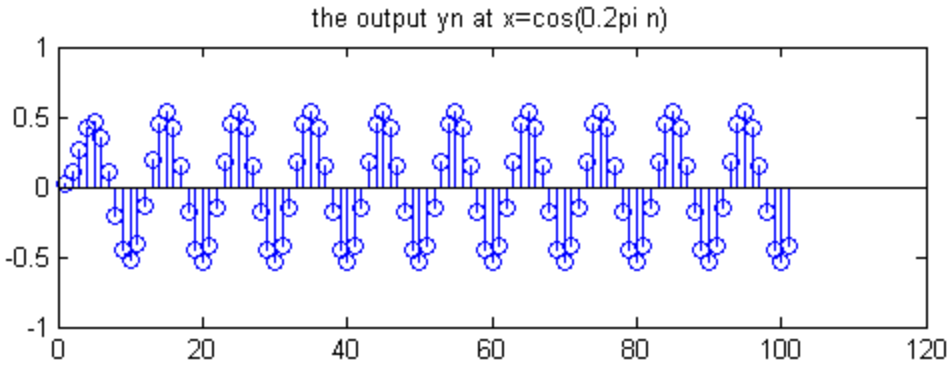


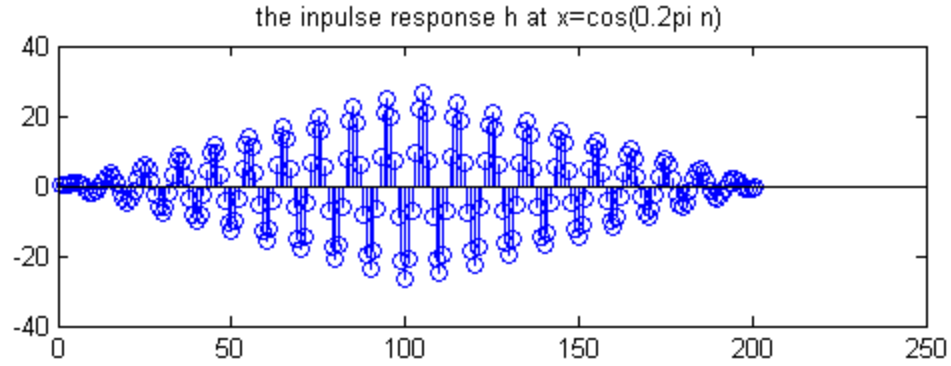
b)steady-state response of the system

```
n2=0:1:100;

x2=cos(0.2*pi*n2);



yn2=[zeros(1,length(n2))];

yn2(1)=0.0181*x2(1);

yn2(2)=0.0181*x2(2)+0.0543*x2(1)+1.76*yn2(1);

yn2(3)=0.0181*x2(3)+0.0543*x2(2)+0.0543*x2(1)+1.76*yn2(2)-1.1829*yn2(1);

yn2(4)=0.0181*x2(4)+0.0543*x2(3)+0.0543*x2(2)+0.0181*x2(1)+1.76*yn2(3)-
1.1829*yn2(2)+0.2781*yn2(1);



for index=5:length(n2)

    yn2(index)=0.0181*x2(index)+0.0543*x2(index-1)+0.0543*x2(index-3)+1.76*yn2(index-
1)-1.1829*yn2(index-2)+0.2781*yn2(index-3);
end
h2=conv(x2,yn2);
```

plot steady_state

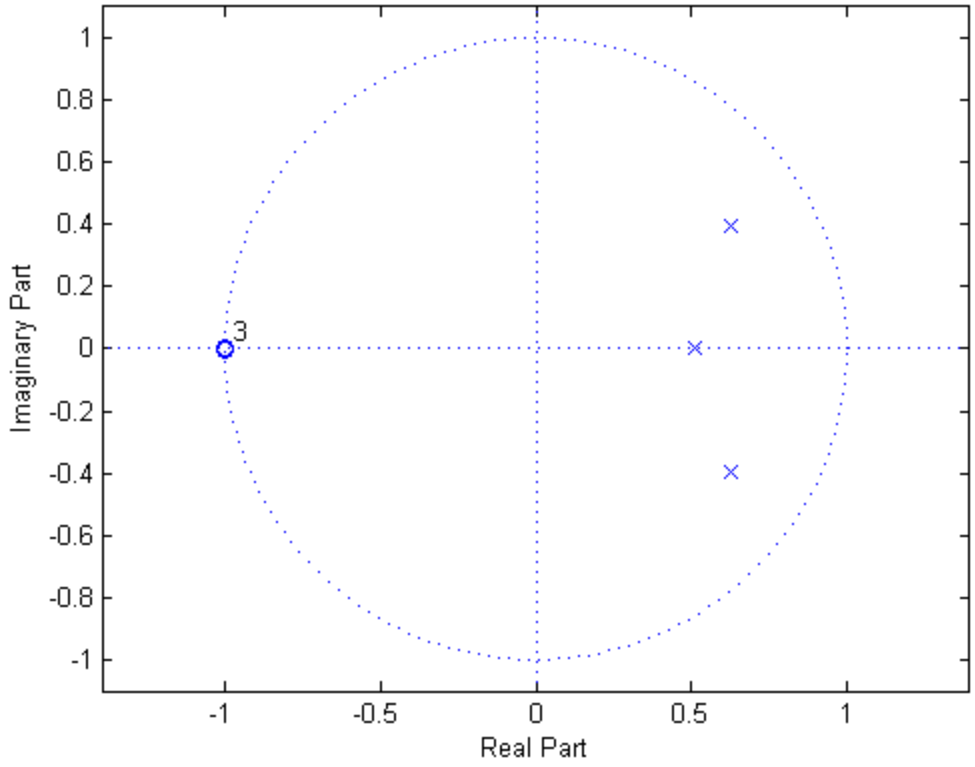
```
figure(2)

subplot(2,1,1)

stem(yn2)

title('the output yn at x=cos(0.2pi n)')

subplot(2,1,2)
stem(h2)
title('the inpulse response h at x=cos(0.2pi n)')
```

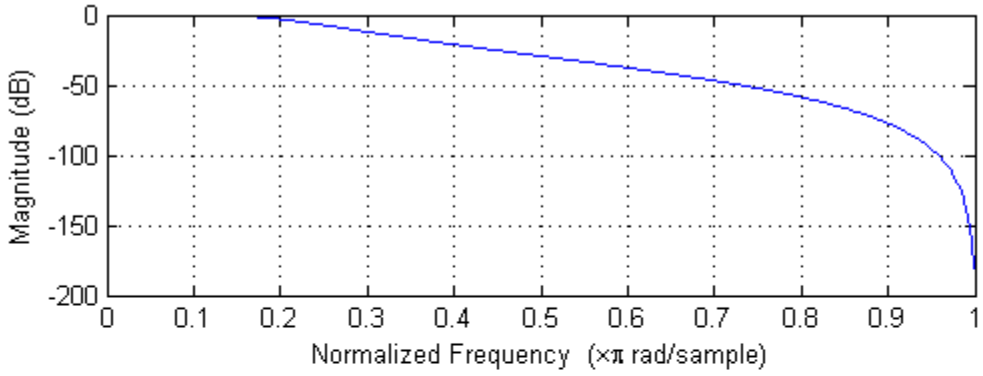


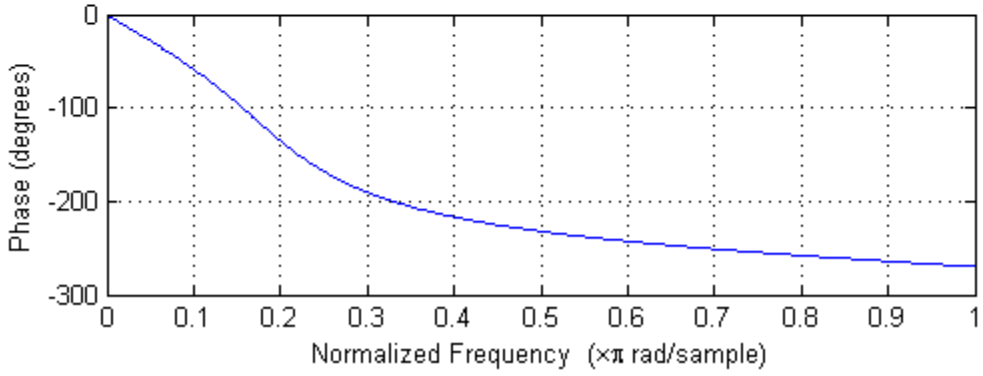


polse and zeros

```
coff_x=[0.0181 0.0543 0.0543 0.0181];

coff_y=[1 -1.76 1.1829 -0.2781];



z=roots(coff_x);

p=roots(coff_y);



figure(3);

         zplane(z,p);

figure(4);

         freqz(coff_x,coff_y);
```


Imaginary Part
Real Part
3
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1
-0.5
0
0.5
1


Magnitude (dB)
Normalized Frequency (×π rad/sample)
0
-50
-100
-150
-200
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1


Phase (degrees)
Normalized Frequency (×π rad/sample)
0
-100
-200
-300
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1