MATLAB

Report

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MATLAB source code :- https://github.com/Hassan-Elseoudy/MATLAB-Sessions/tree/master/Project

Q1)

N1 set the range of 5 periodic signal

```
n1 = [-12:12]; to be symmetric
```

X1 set the periodic signal

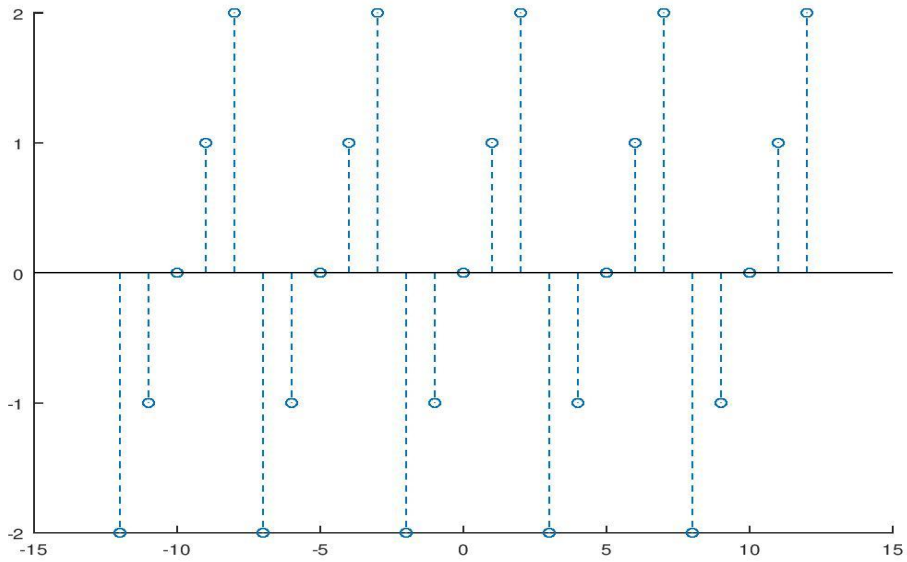
```
x1 = [-2,-1,0,1,2];
```

```
use to concatenate the 5 periodic signals
```

```
xQ1 = [x1,x1,x1,x1,x1];
```

```
Stem n1 with XQ1
```

```
stem(n1,xQ1,'--');
```



Q2) N2 set the range of 5 periodic signal

```
n2 = [-22:43];
```

X2 set the periodic signal use exp

```
exp(0.1*[0:21]).*(stepseq(0,0,21)-stepseq(20,0,21));
```

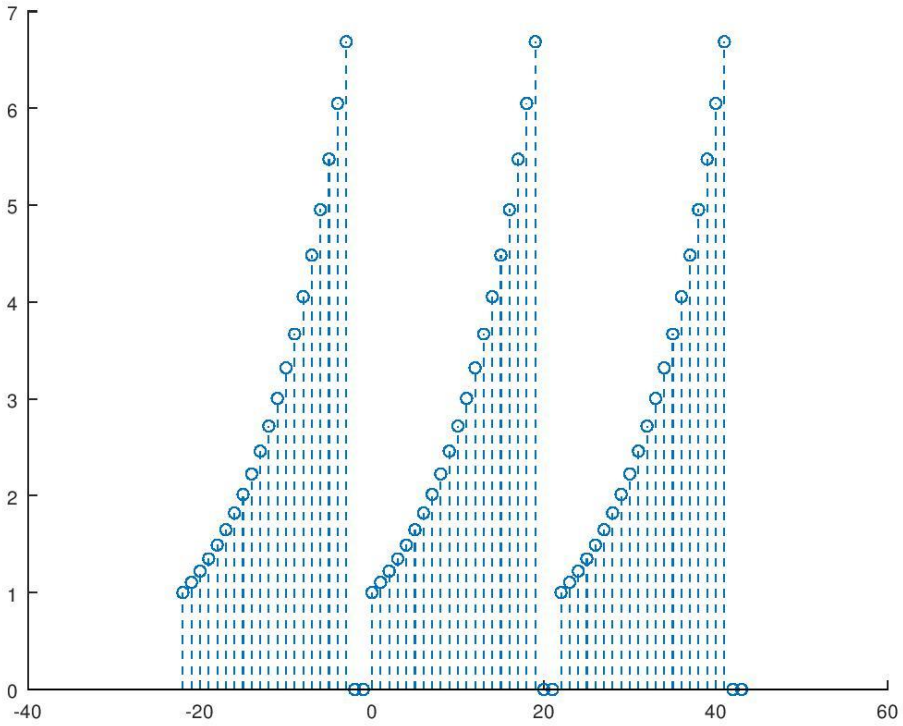
And use stepseq to generate unit step seq

```
xQ1 = [x2,x2,x2];
```

use to concatenate the 3 periodic signals

```
stem(n2,xQ2,'--');
```

Stem n2 with XQ2



Q3)

N3 set the range of 4 periodic signal

```
n3 = [-12:35];
```

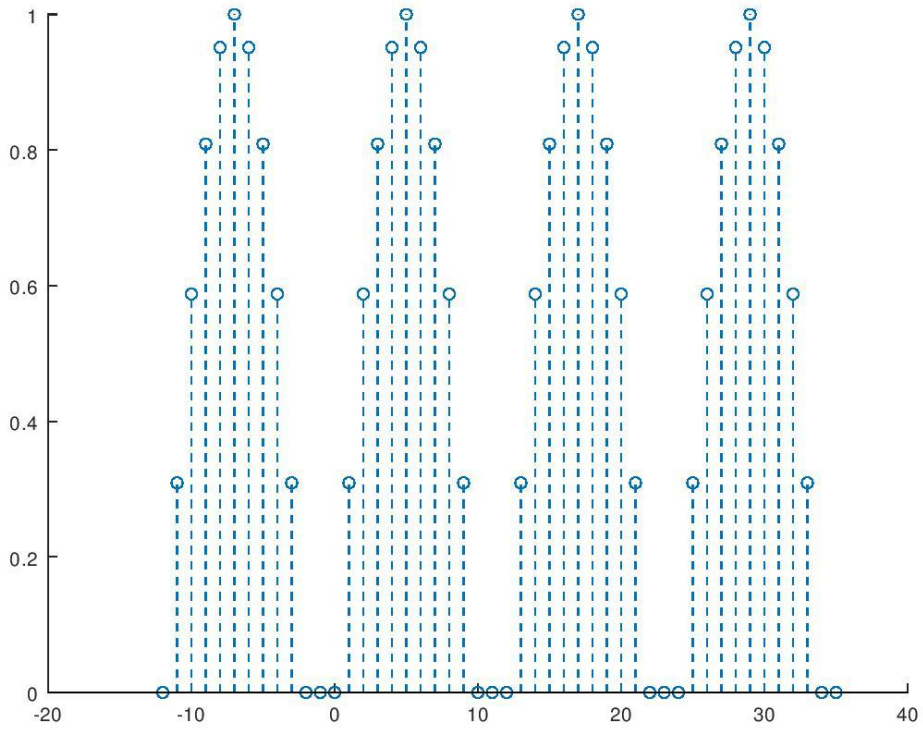
X3 set the periodic signal use sin and step seq

```
x3 = sin(0.1*pi*[0:11]).*(stepseq(0,0,11)-
stepseq(10,0,11));

xQ3 = [x3,x3,x3,x3];
```

use to concatenate the 4 periodic signals

```
stem(n3,xQ3,'-
-');
```

Stem n3 with XQ3



Q4)

N4 set the range of periodic signal

```
n4 = [0:24];
```

X4a1 set the first periodic signal

```
x4a1 = [1 2 3];

x4a = [x4a1 x4a1 x4a1 x4a1 x4a1 x4a1 x4a1 x4a1 x4a1];
```

use to concatenate the 9 periodic signals of first signal

```
x4b1 = [1 2 3 4];
```

X4b1 set the second periodic signal

```
x4b = [x4b1 x4b1 x4b1 x4b1 x4b1 x4b1 x4b1]
```

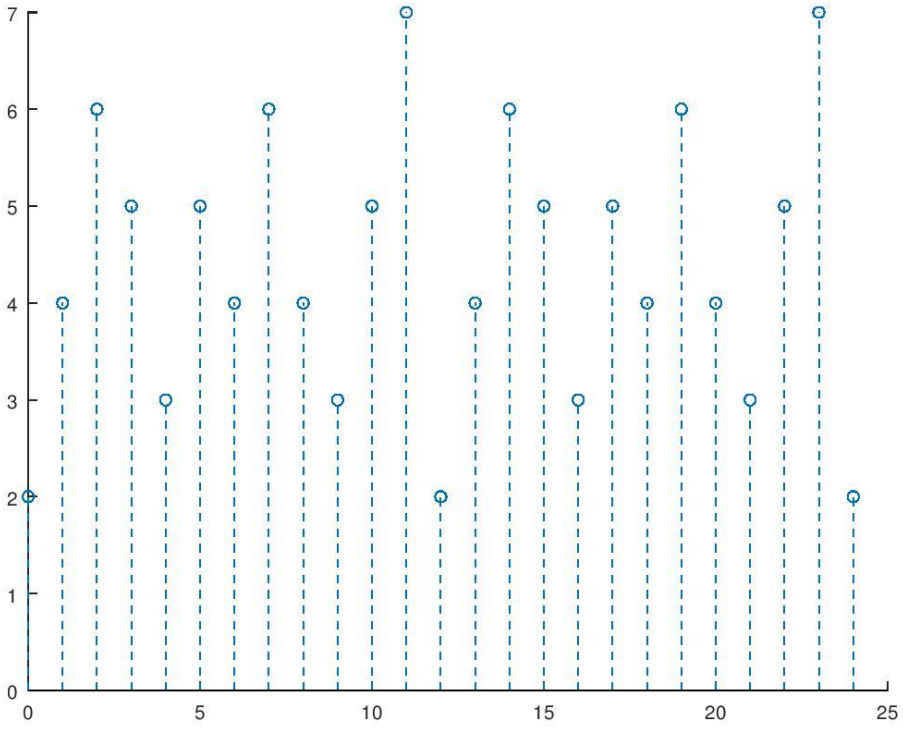
use to concatenate the 6 periodic signals of first signal

```
xQ4 = x4a(1:25) + x4b(1:25);
```

XQ4 ADD two signals

```
stem(n4,xQ4,'--');
```

Stem n4 with XQ4



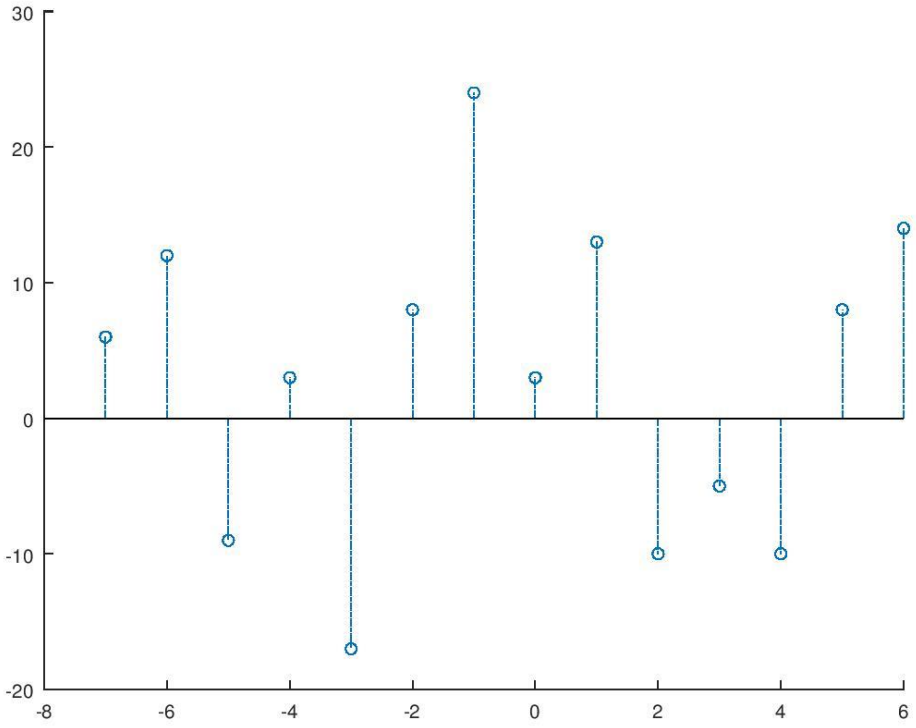
Q1b)

sigshift->use to generate signal with a shift

sigadd->add two signals

sigmult->mul two signals

a) `[x11,n11] = sigshift(x,n,3);`
Use to shift the signal by -3
`[x12,n12] = sigshift(x,n,-4);`
Use to shift the signal by 4
`[x13,n13] = sigadd(2*x11,n11,3*x12,n12);`
`[xQ1b,n1b] = sigadd(x13,n13,-x,n);`
Add the two previous signals and mult by their amplitude
`stem(n1b,xQ1b,'-.');`



b)

`[x21,n21] = sigshift(x,n,-4);`

Shift the signal by 4

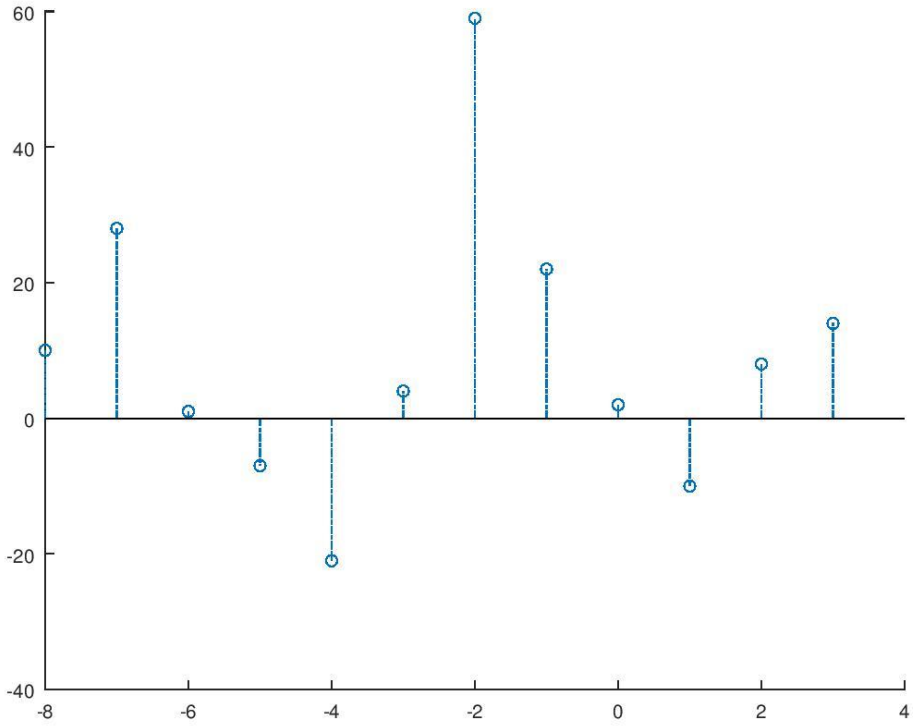
```
[x22,n22] = sigshift(x,n,-5);
```

Shift by 5

```
[x23,n23] = sigadd(4*x21,n21,5*x22,n22);
```

Add two signals and mult by its amplitude

```
[xQ2b,n2b] = sigadd(x23,n23,2*x,n)
stem(n2b,xQ2b,'-.');
```

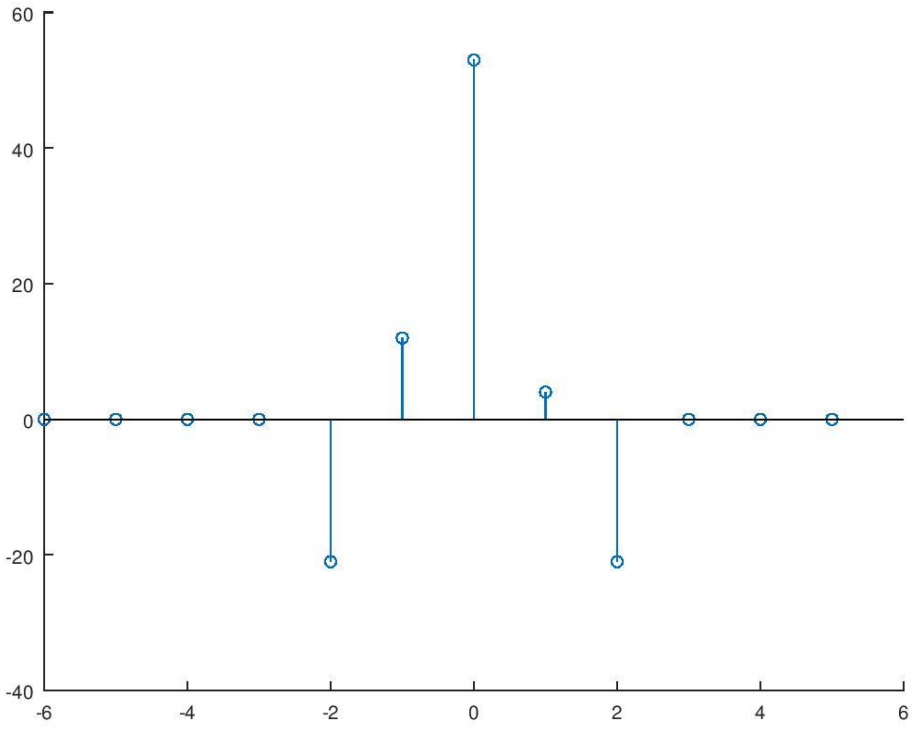


c)

shift the signal

```
[x31,n31] = sigshift(x,n,-3);
[x32,n32] = sigshift(x,n,+2);
[x33,n33] = sigshift(x,n,-1);
```

```
Use sigold to convert (1-n)->(n-1)
[x34,n34] = sigfold(x33,n33);
Use mult to multiple signals
[x31b,n31b] = sigmult(x31,n31,x32,n32);
[x32b,n32b] = sigmult(x34,n34,x35,n35);
Add the previous signals
[xQ3b,n3b] =sigadd(x31b,n31b,x32b,n32b);
stem(n3b,xQ3b,'-.');
```



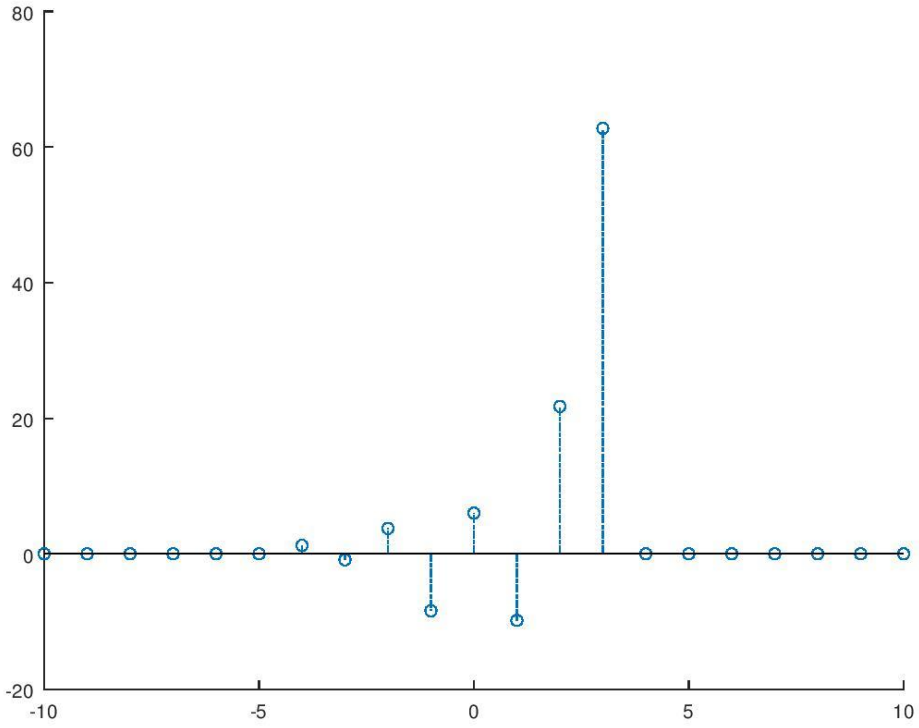
d)

n4 for the range of signal

```
n4 = [-10:10];
```

use exp and cos

```
x41 = 2*exp(0.5*n4);
x412 = cos(0.1*pi*n4);
use mult and shift and add signals
[x42,n42] = sigmult(x41,n4,x,n);
[x43,n43] = sigshift(x,n,-2);
[x44,n44] = sigmult(x412,n42,x43,n43);
[xQ4b,n4b] = sigadd(x42,n42,x44,n44);
```



Q2)

a)

Set the first function x

```
x1 = [1,2,4];
```

N to its interval

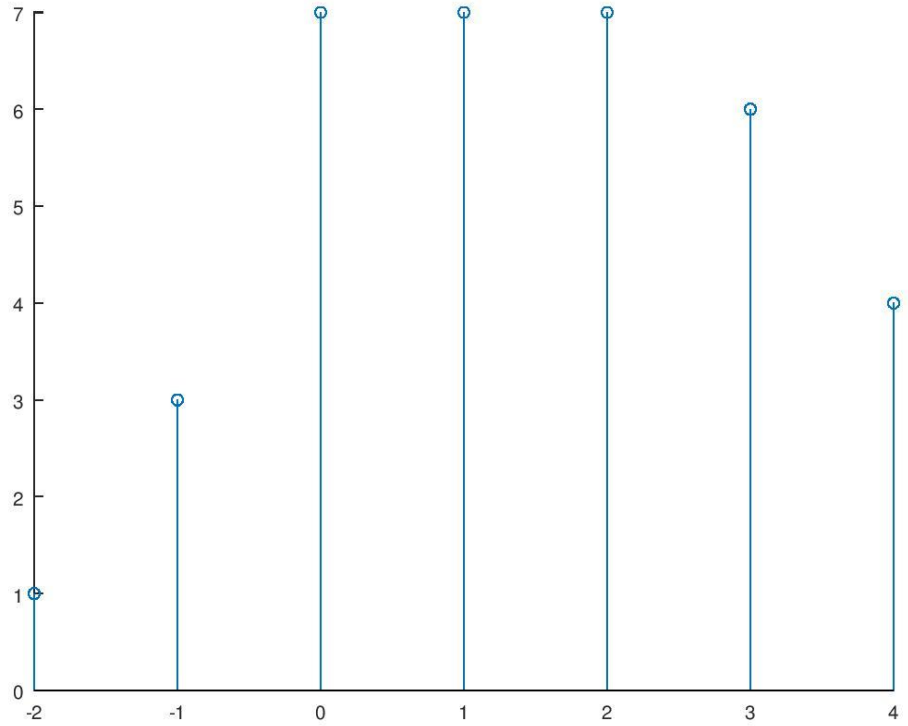
```
nx = [0:2];
```

Same to second function h

```
h1=[1,1,1,1,1];
nh= [-2:2];
```

The conv them

```
[y,ny] =
conv_m(x1,nx,h1,nh);
                        stem(ny,y);
```



b)

Set the first function x

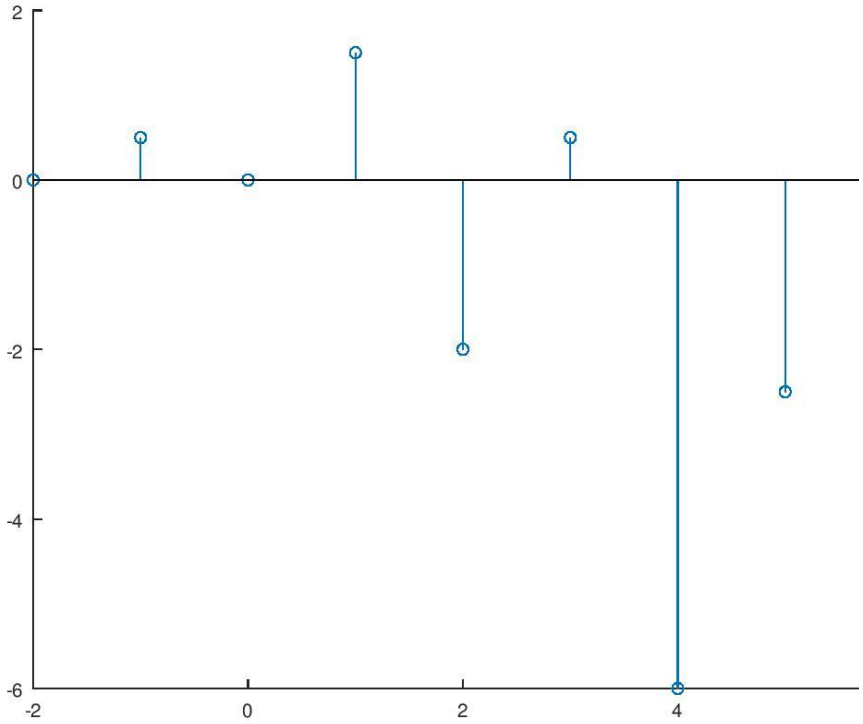
```
x2 = [0,1,-2,3,-4];
```

N to its interval

```
nx2 = [0:4];
```

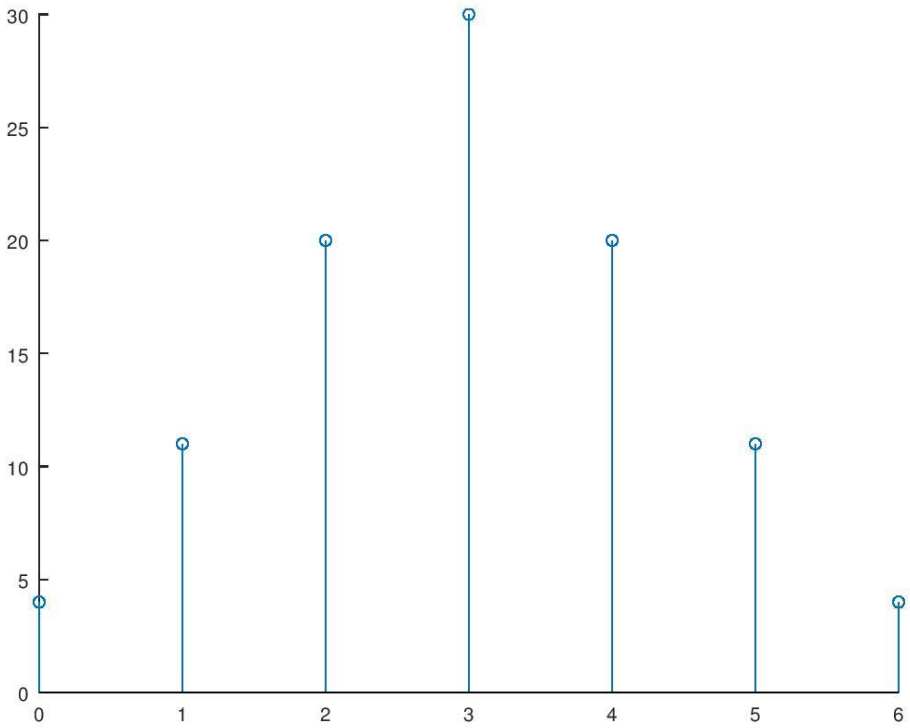
Same to second function h

```
  h2 =
  [0.5,1,2,1,0.5];

  nh2 = [-2:2];

  [y2,ny2] = conv_m(x2,nx2,h2,nh2);
 stem(ny2,y2);
```



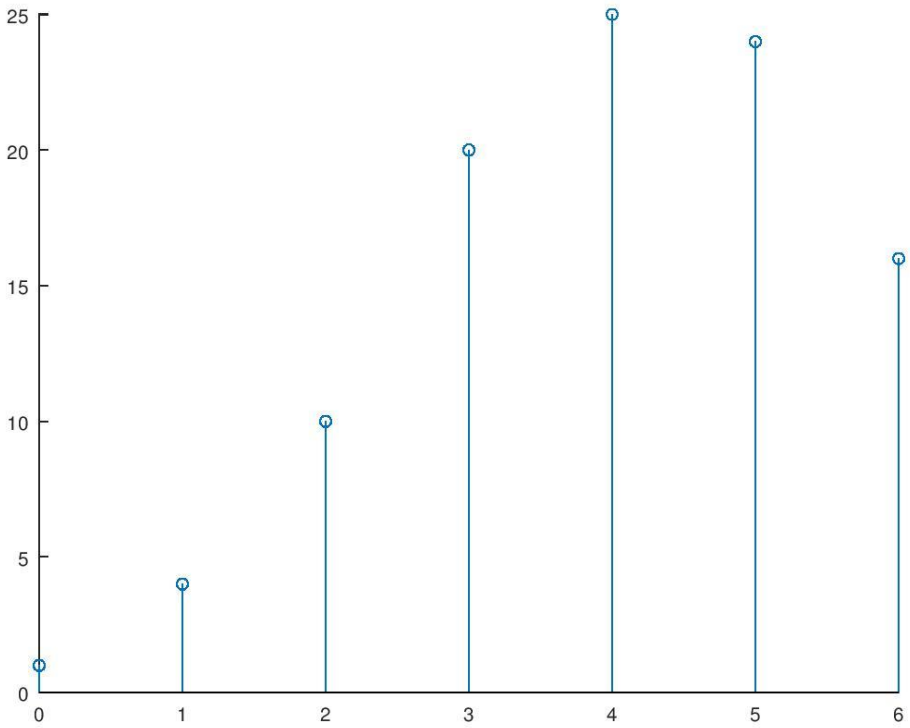
c)

```
Set the first function x
x3 = [1,2,3,4];
N to its interval
nx3 = [0:3];
Same to second function h
h3 = [4,3,2,1];
nh3= [0:3];
The conv them
[y3,ny3] = conv_m(x3,nx3,h3,nh3);
```



d)

```
Set the first function x
x4 = [1,2,3,4];
N to its interval
nx4 = [0:3];
Same to second function h
h4 = [1,2,3,4];
nh4 = [0:3];
The conv them
[y4,ny4] = conv_m(x4,nx4,h4,nh4);
```



Q3)

Define numerator and denominator of transfer function

```
num = [1 -2 2 -1];
den = [ 1 -1.7 0.8 -0.1];
```

use tf to get the form of z transform

```
H = tf(num,den,0.1,'variable','z^-1');
```

To draw the freq response of LIT system from tf

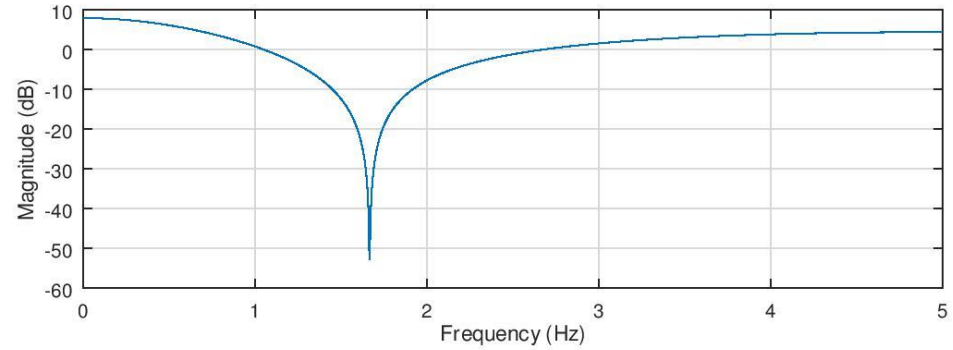
```
freqz(num,den,1000,10)
```

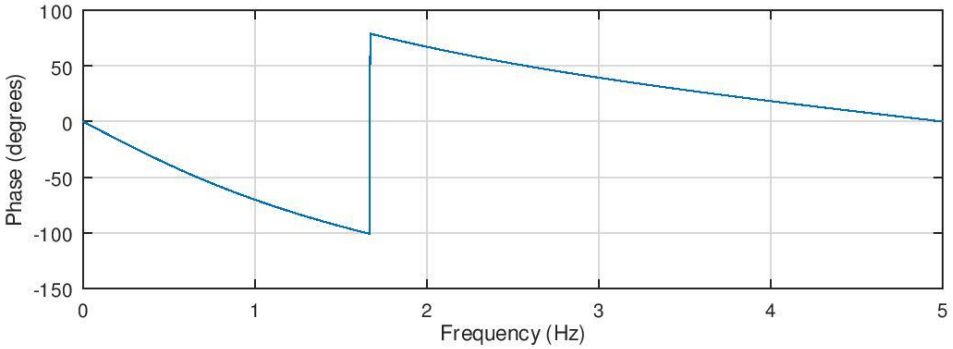
calc poles and zeros

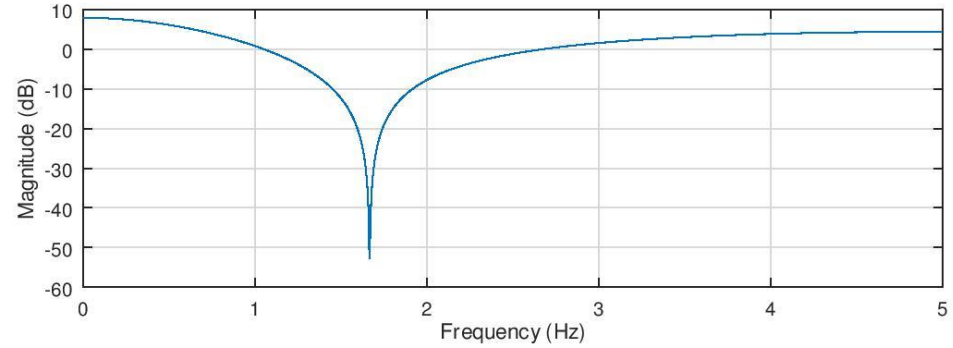
```
zplane(num,den)
[p,z] = pzmap(H)
```

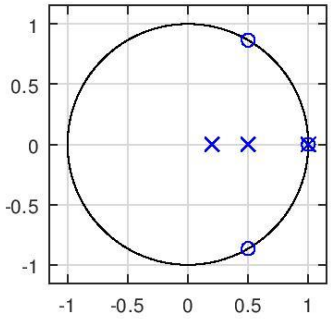
Use filter to get impulse first point to one and all point to zero

```
impulse = filter(num,den,[1 zeros(1,99)]);

plot(impulse)
```

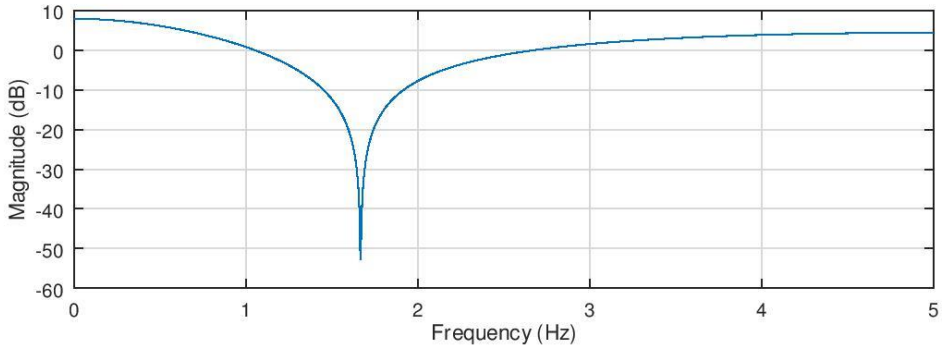

Magnitude (dB)
10
0
-10
-20
-30
-40
-50
-60
0
1
2
3
4
5
Frequency (Hz)

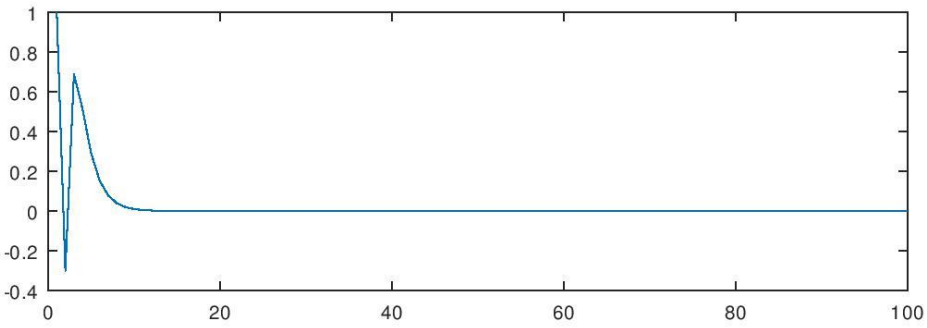

Phase (degrees)
100
50
0
-50
-100
-150
0
1
2
3
4
5
Frequency (Hz)


Magnitude (dB)
10
0
-10
-20
-30
-40
-50
-60
0
1
2
3
4
5
Frequency (Hz)


1
0.5
0
-0.5
-1
-1
-0.5
0
0.5
1

```
p =

    1.00000
    0.50000
    0.20000

z =

    1.00000 + 0.00000i
    0.50000 + 0.86603i
    0.50000 - 0.86603i
```





Q3b)

Define numerator and denominator of transfer function

```
num = [1 -2 2 -1];
den = [ 1 -1.7 0.8 -0.1];
```

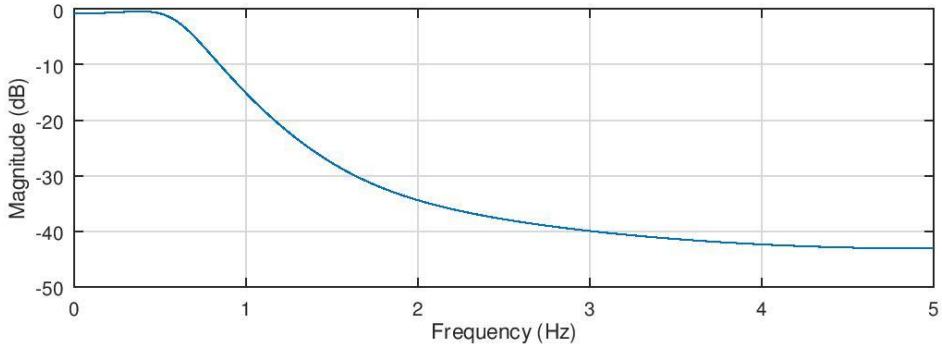
use tf to get the form of z transform

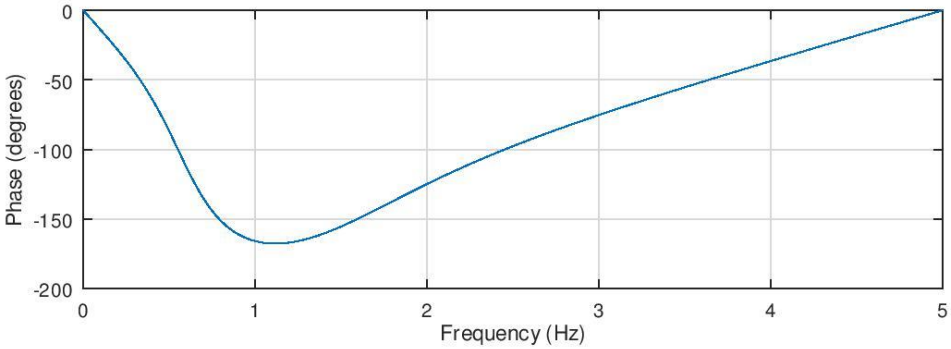
```
H = tf(num,den,0.1,'variable','z^-1');
```

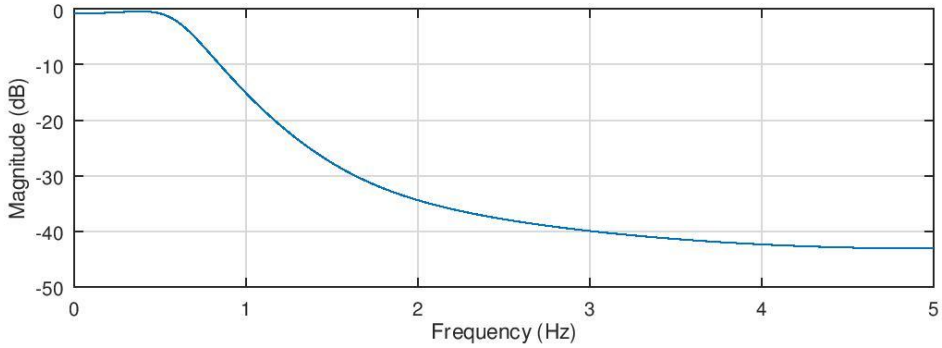
To draw the freq response of LIT system from tf

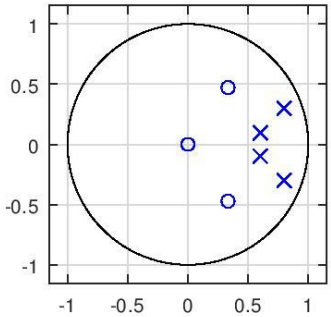
```
freqz(num,den,1000,10)
```

```
calc poles and zeros

zplane(num,den)

[p,z] = pzmap(H)

Use filter to get step response first all point to
one

step = filter(num,den,[1 zeros(1,99)]);

plot(step)
```

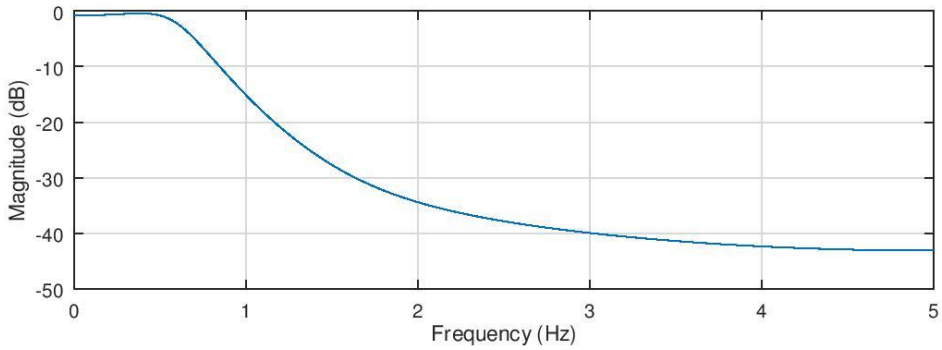

Magnitude (dB)
0
-10
-20
-30
-40
-50
0
1
2
3
4
5
Frequency (Hz)

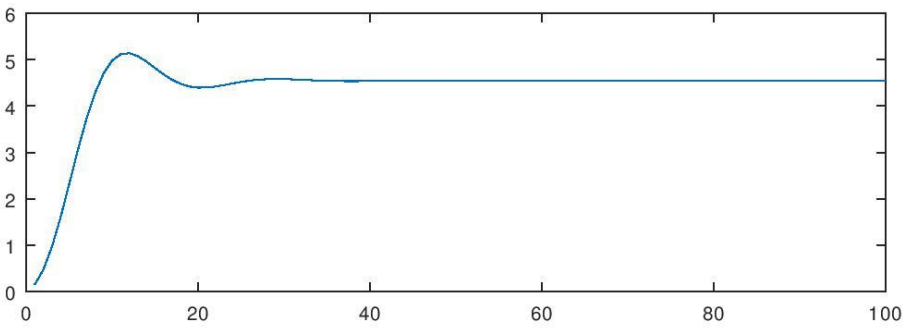

Phase (degrees)
0
-50
-100
-150
-200
0
1
2
3
4
5
Frequency (Hz)


Magnitude (dB)
0
-10
-20
-30
-40
-50
0
1
2
3
4
5
Frequency (Hz)


1
0.5
0
-0.5
-1
-1
-0.5
0
0.5
1

```
p2 =

   0.79875 + 0.30043i
   0.79875 - 0.30043i
   0.60125 + 0.09616i
   0.60125 - 0.09616i

z2 =

   0.33333 + 0.47140i
   0.33333 - 0.47140i
```





Q4)

Use to set a function x1

```
x1 = stepseq(0,0,10) - stepseq(6,0,10);
```

use fft to get fourier transform

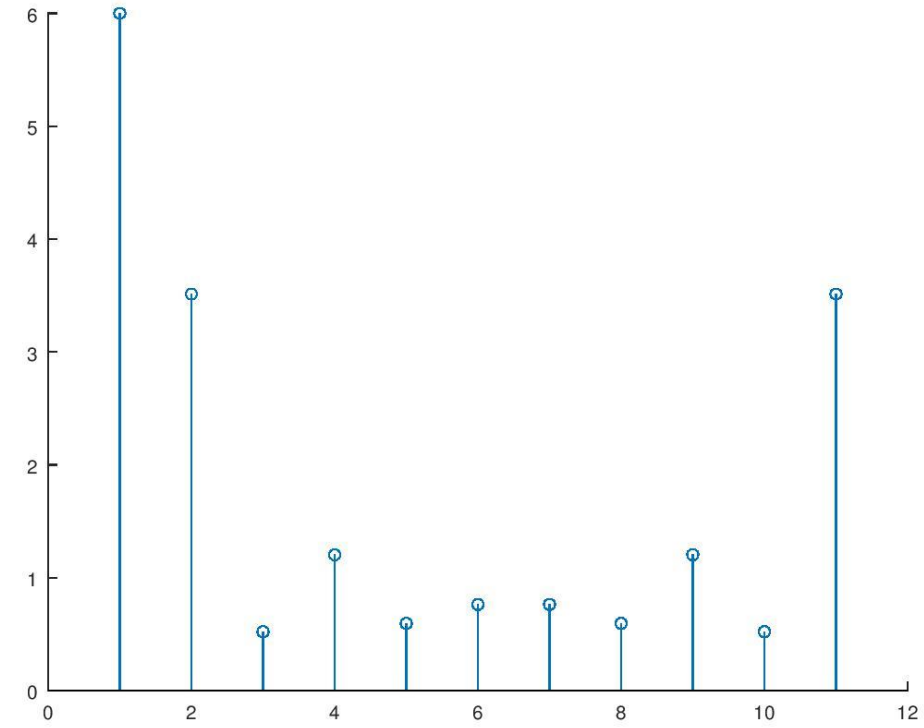
```
X1 = fft(x1);
```

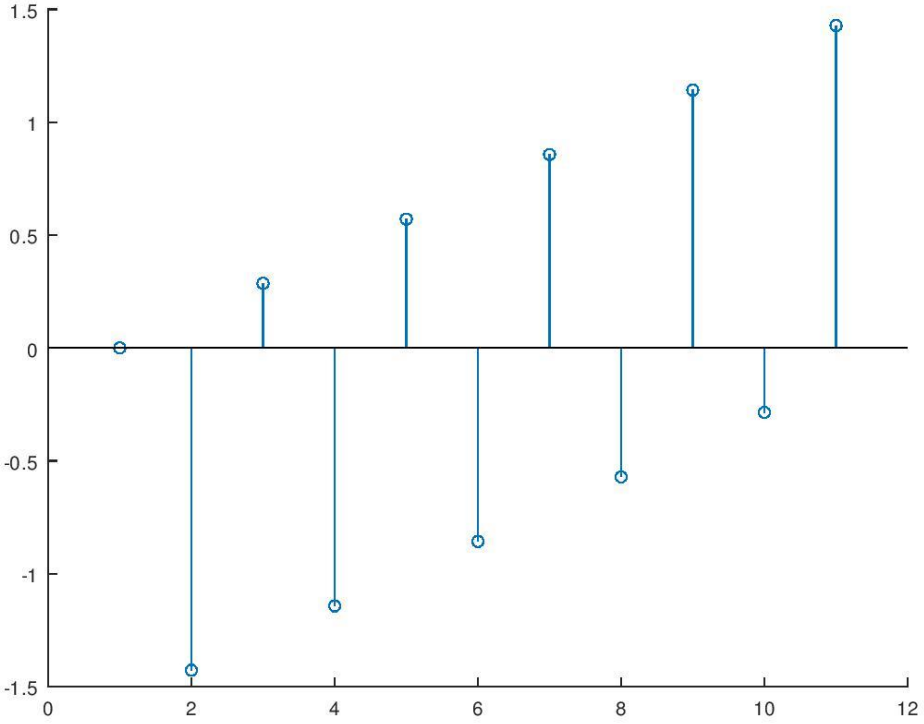
Stem abs for stem magnitude

```
stem(abs(X1));
```

stem angle for stem the phase

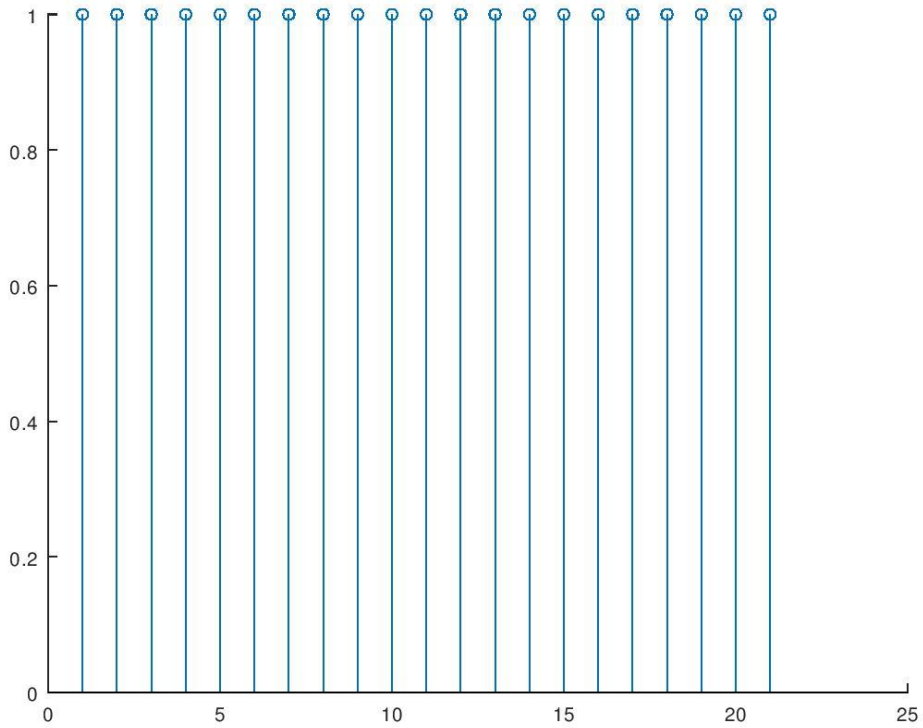
```
stem(angle(X1));
```

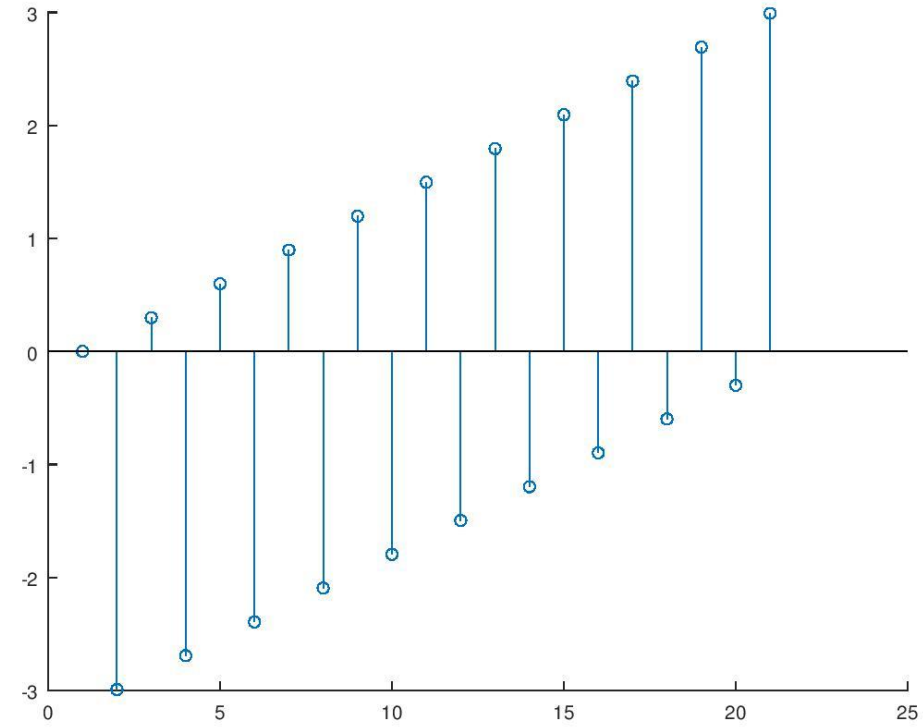




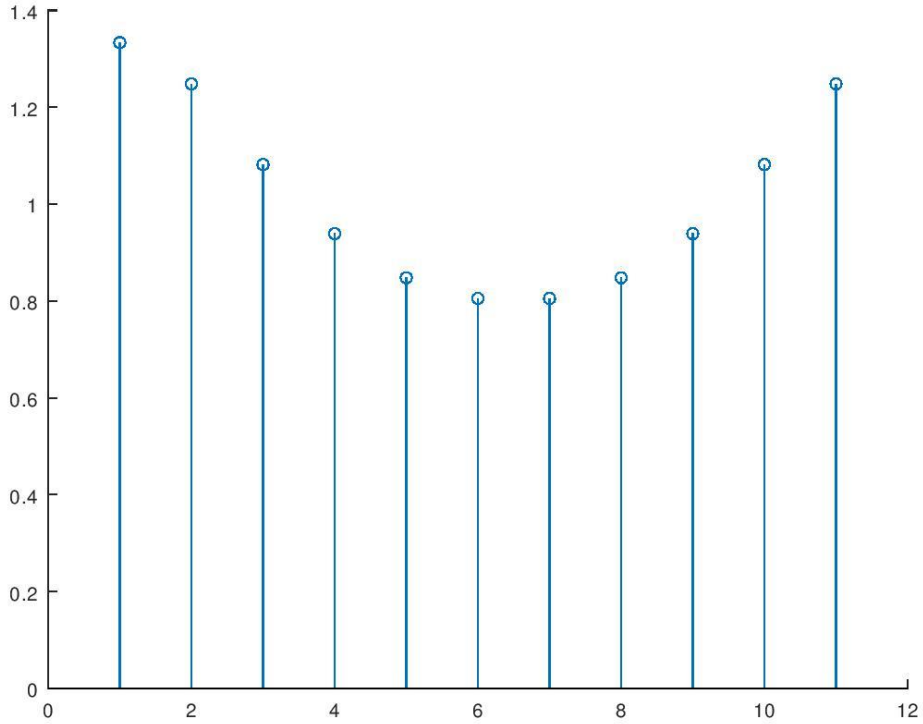
b)

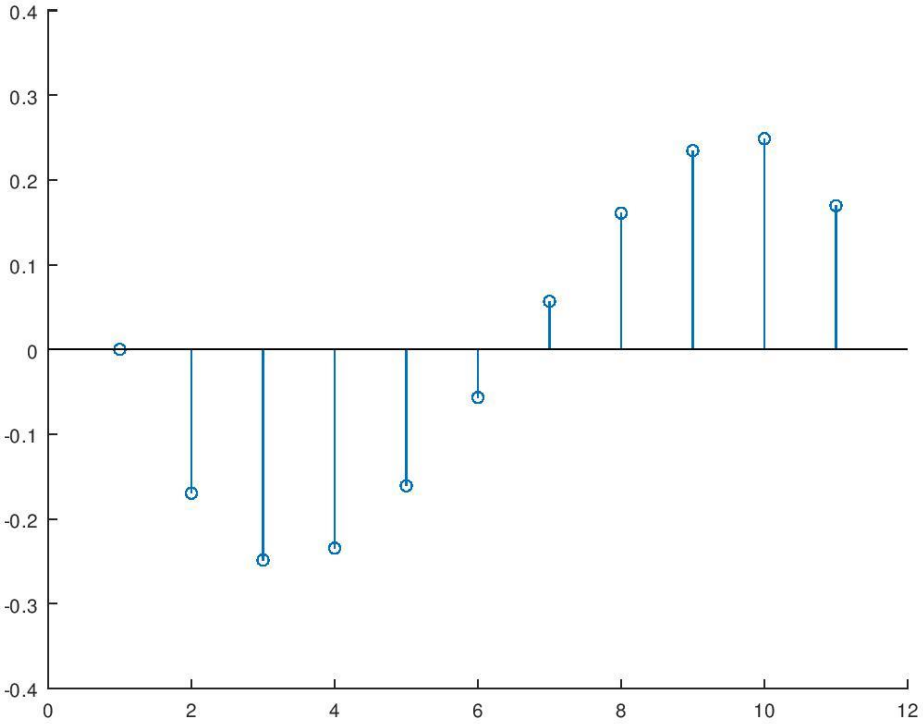
```
n2 = [0:10];

n2 to set the range

[x22,n22] = stepseq(0,0,10);

For first function

[x22,n22] = sigfold(x22,n22);

[x2,n2] = sigmult(x21,n2,x22,n22);

For second function

X2 = fft(x2);

Get fourier transform

stem(abs(X2));
                stem(angle(X2))
                get magnitude and phase
```



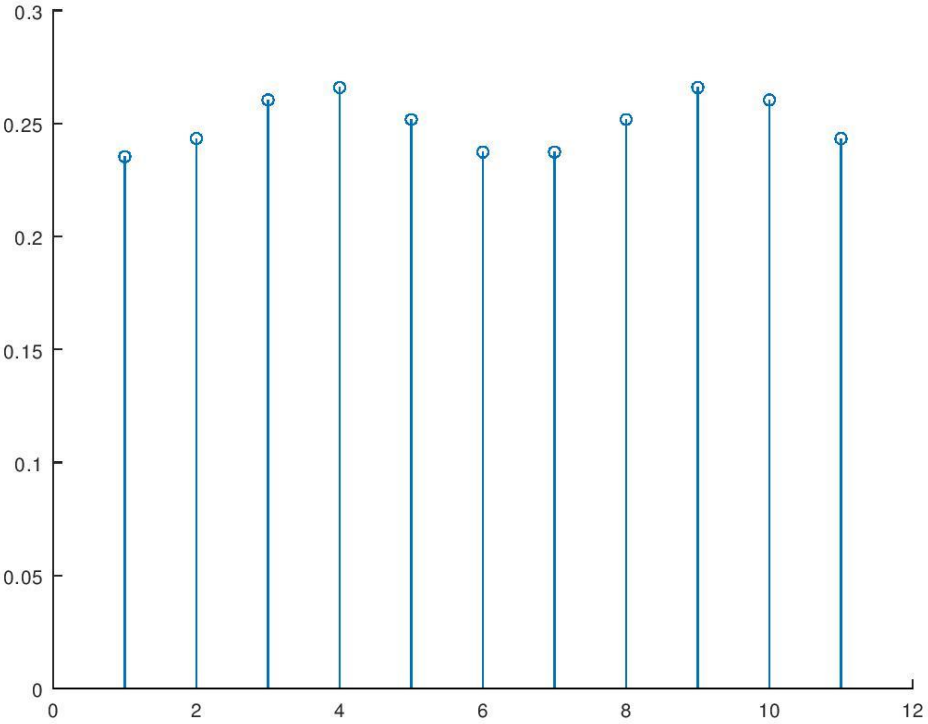


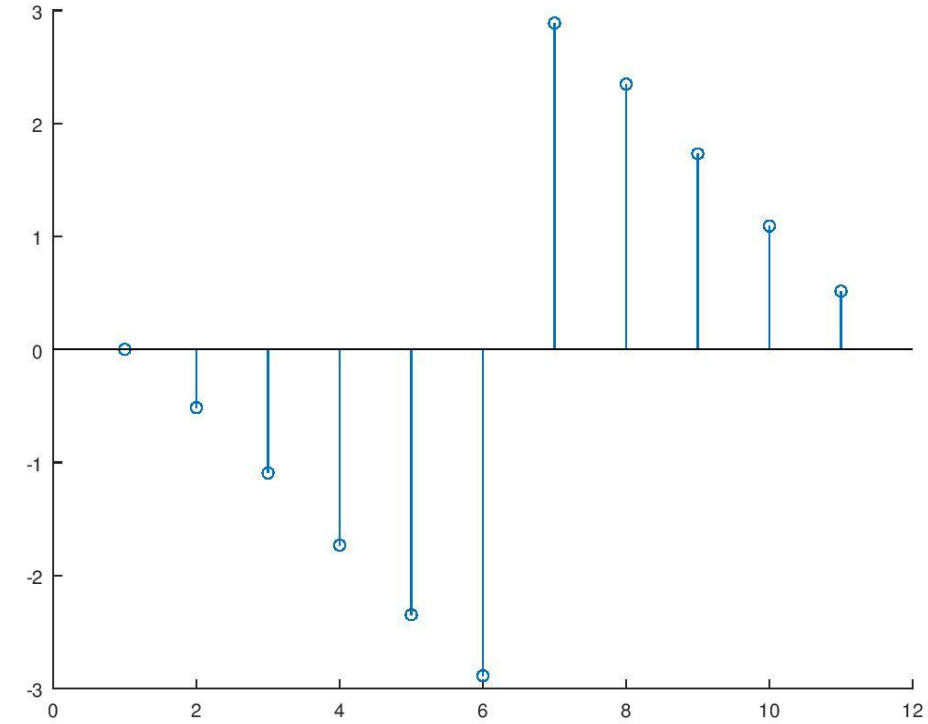
c)



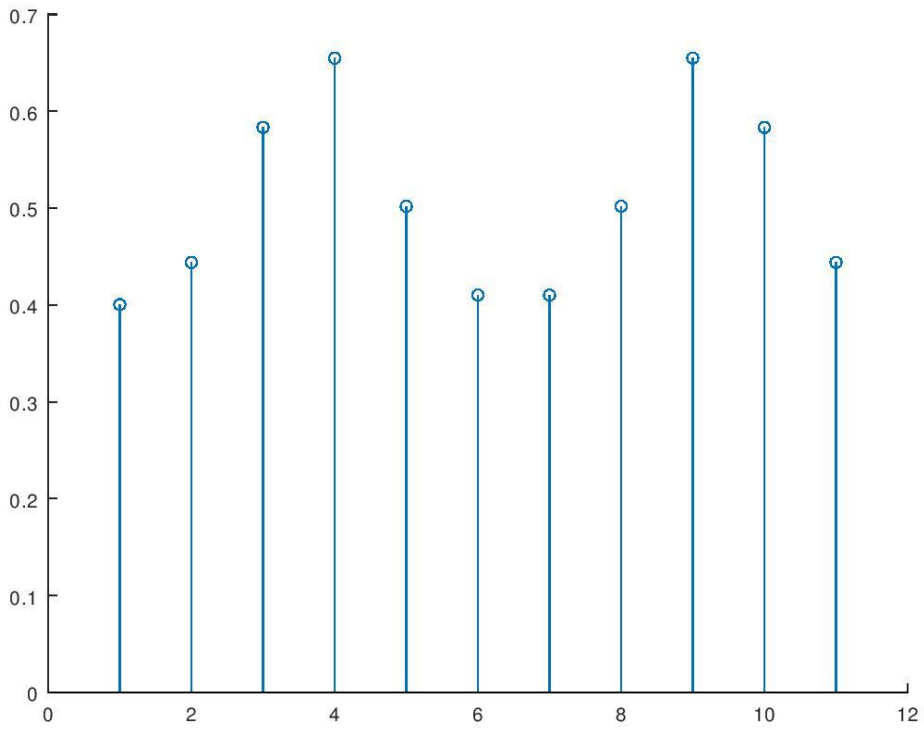


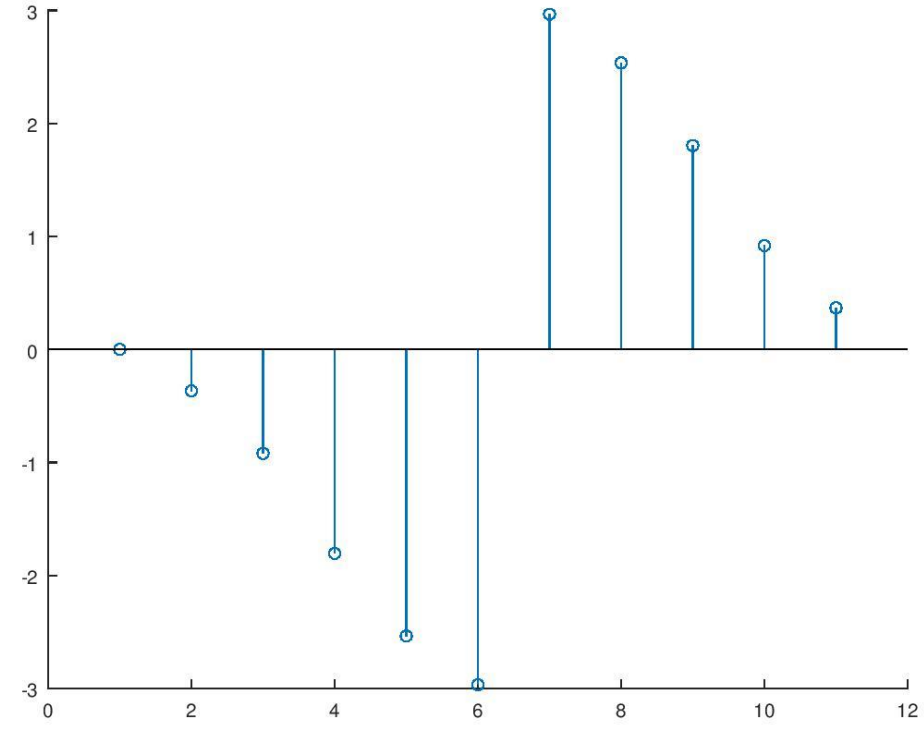
d)



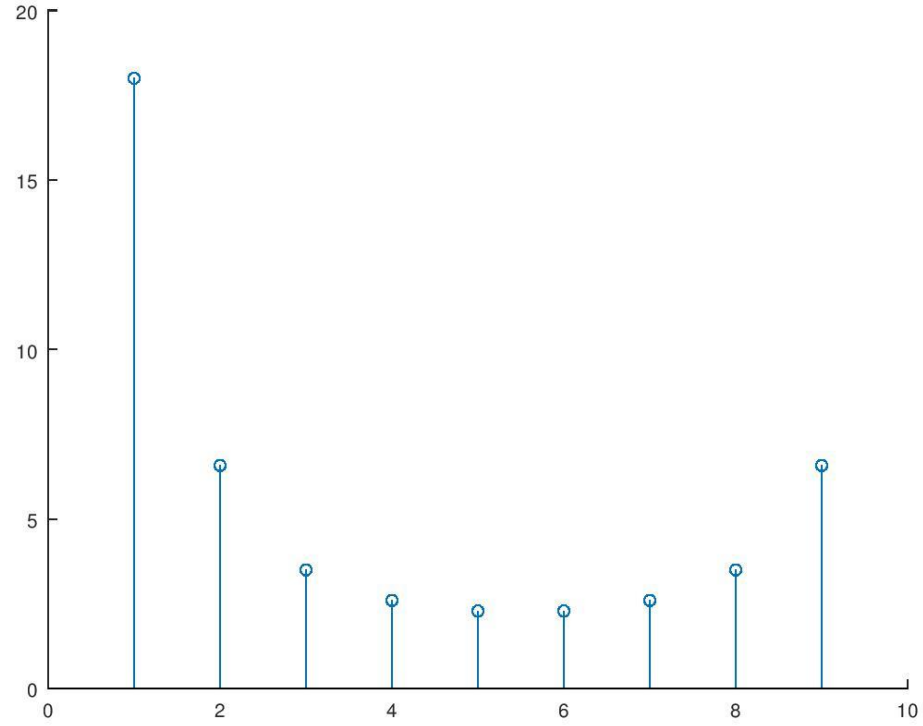


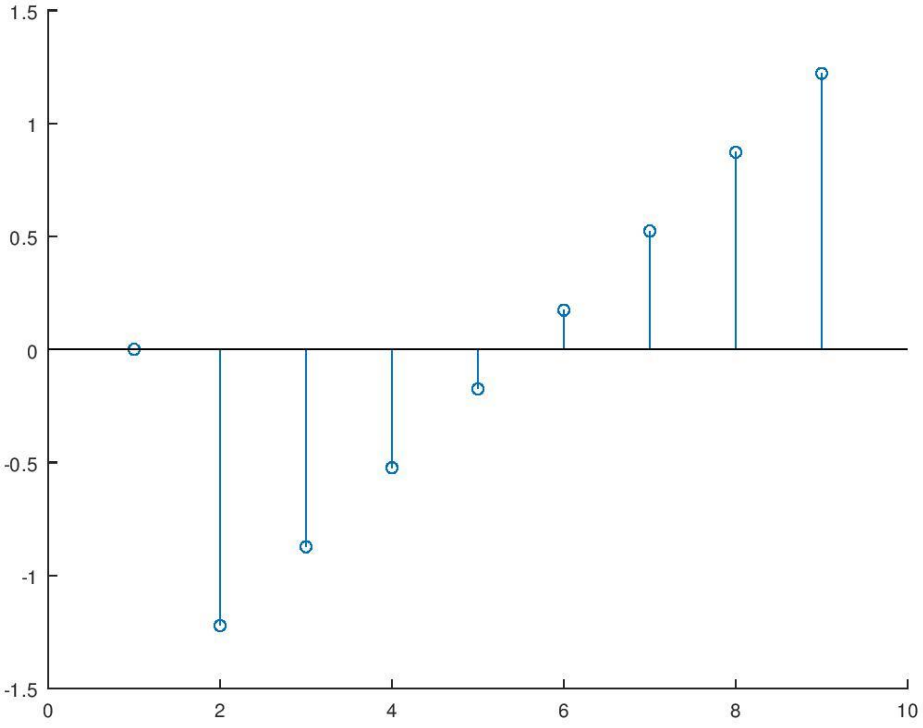
e)


0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
2
4
6
8
10
12

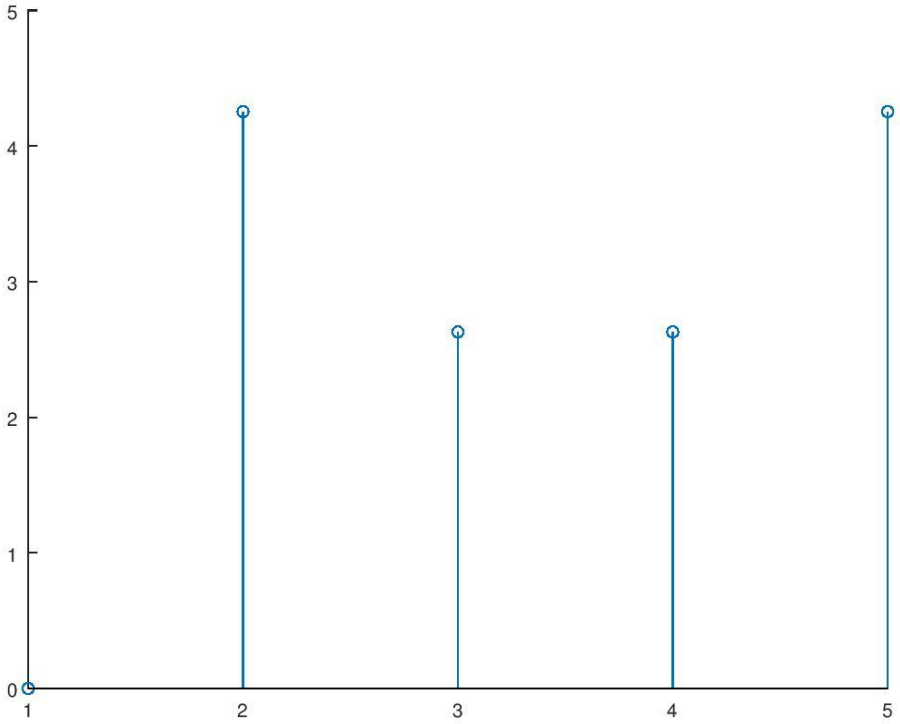

3
2
1
0
-1
-2
-3
0
2
4
6
8
10
12

f)





g)


5
4
3
2
1
0
1
2
3
4
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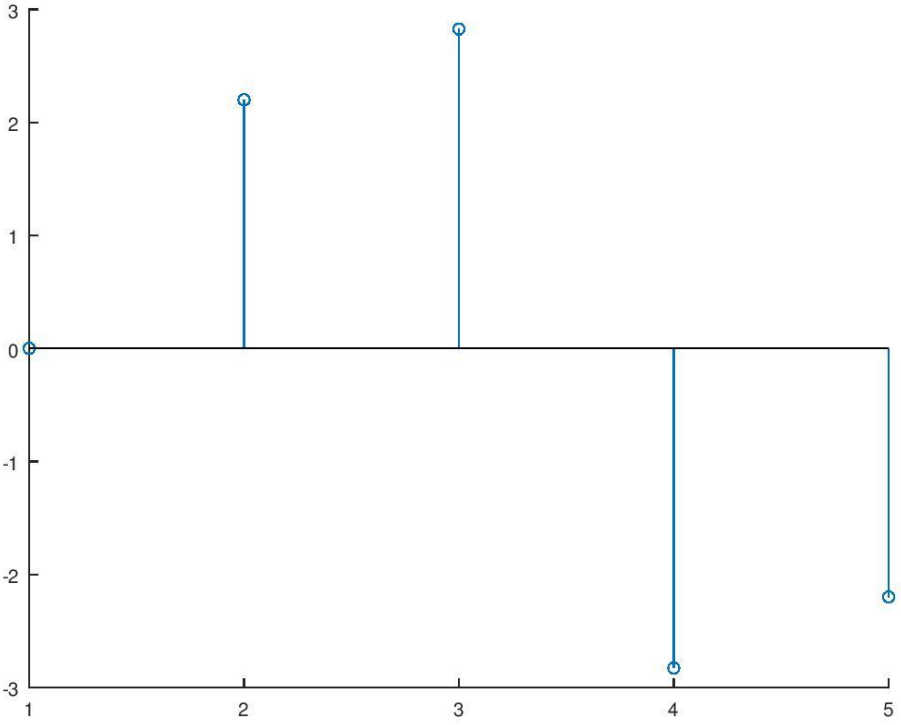
3
2
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-1
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2
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