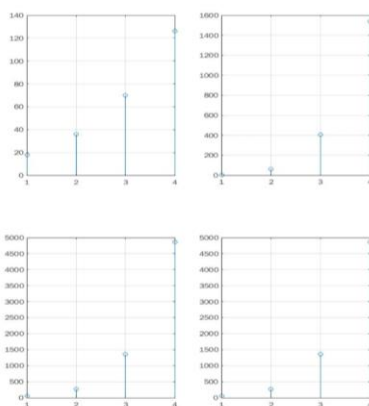## LINEARITY

```
clc;
clear all;
close all;
i = 1:4;
n = [1 2 3 4];
a1 = 2;
a2 = 3;
x(i) = n.^2;
y(i) = (n+2).*x(i);
x1(i)=(n.^2)+5;
w(i)=(n.^2);
x2(i) = x(i).^2;
y1(i) = (n+2).*x1(i);
y2(i) = (n+2).*x2(i);
w(i) = (a1*x1(i))+ (a2*x2(i));
y3(i) = (n+2).*w(i);
w1(i) = a1.*y1(i);
w2(i) = a2.*y2(i);
y4(i) = w1(i)+w2(i);
subplot(2,2,1);
stem (n, y1(i))
grid on;
subplot (2,2,2);
stem (n, y2(i))
grid on;
subplot(2,2,3);
stem (n, y3(i))
grid on;
subplot (2,2,4);
stem (n, y4(i))
grid on;
```


Figure 1: clc; clear all; close all; i = 1:4; n = [1 2 3 4]; a1 = 2; a2 = 3; x(i)...

TIME REVERSAL

```
n=input('ENTER THE TIME SAMPLE RANGE');
x=input('Enter the corresponding amplitudes');
subplot(2,1,1);
stem(n,x);
xlabel('Time sample');
ylabel('AMPLITUDE');
title('ORIGINAL SEQUENCE');
n2=-fliplr(n);
x2=fliplr(x);
subplot(2,1,2);
stem(n2,x2);
xlabel('Time sample');
ylabel('AMPLITUDE');
title('TIME REVERSED SEQUENCE');
```

```
>> n=input('ENTER THE TIME SAMPLE RANGE');
   x=input('Enter the corresponding
   amplitudes');
   subplot(2,1,1);
   stem(n,x);
   xlabel('Time sample');
   ylabel('AMPLITUDE');
   title('ORIGINAL SEQUENCE');
   n2=-fliplr(n);
   x2=fliplr(x);
   subplot(2,1,2);
   stem(n2,x2);
   xlabel('Time sample');
   ylabel('AMPLITUDE');
   title('TIME REVERSED SEQUENCE');

ENTER THE TIME SAMPLE RANGE

0:2

Enter the corresponding amplitudes

[ 1 2 3]
```
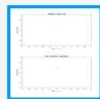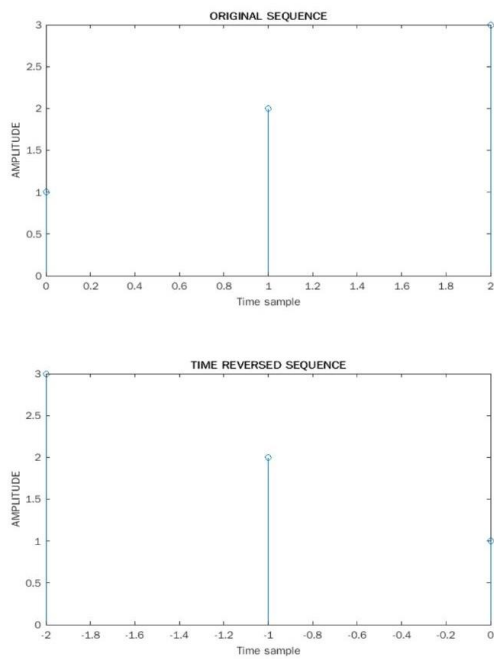
ORIGINAL SEQUENCE

TIME REVERSED SEQUENCE

CIRCULAR TIME SHIFT

```
x_n=input('Enter the sequence:');
m=input('Enter required amount of shift:');
N=length(x_n);
X_K=fft(x_n,N);
K=0:N-1;
a=exp(-1i*((2*pi)/N).*K*m);
X2_K=X_K.*a;
x2_n=ifft(X2_K)
```

```
>> x_n=input('Enter the sequence:');
   m=input('Enter required amount of
   shift:');
   N=length(x_n);
   X_K=fft(x_n,N);
   K=0:N-1;
   a=exp(-1i*((2*pi)/N).*K*m);
   X2_K=X_K.*a;
   x2_n=ifft(X2_K)

Enter the sequence:

[1 5 3 4 2 6]

Enter required amount of shift:

4

x2_n =

  Columns 1 through 2

    3.0000 + 0.0000i   4.0000 - 0.0000i

  Columns 3 through 4

    2.0000 - 0.0000i   6.0000 + 0.0000i

  Columns 5 through 6

    1.0000 - 0.0000i   5.0000 + 0.0000i

>>|
```

MULTIPLICATION OF TWO SEQUENCE

```
clc
clear all


close all
n1=input('Enter the time sample range of x');
x=input('Enter the sequence');
n2=input('Enter the time sample range of y');
y=input('Enter the sequence');


u=min(min(n1),min(n2));
t=max(max(n1),max(n2));
r=u:1:t;
z1=[];
temp=1;


for i=1:length(r)
    if(r(i)<min(n1) || r(i)>max(n1))
```

```
    z1=[z1 0];
   else


     z1=[z1 x(temp)];
     temp=temp+1;
   end
end
z2=[];


temp=1;
for i=1:length(r)
  if(r(i)<min(n2) || r(i)>max(n2))
    z2=[z2 0];


  else
    z2=[z2 y(temp)];
    temp=temp+1;
  end
end
z=z1.*z2;
subplot(3,1,1);
stem(r,z1);


subplot(3,1,2);
stem(r,z2);
subplot(3,1,3);
stem(r,z);
```

```
        else
            z2=[z2 y(temp)];
            temp=temp+1;
        end
    end
    z=z1.*z2;
    subplot(3,1,1);
    stem(r,z1);


    subplot(3,1,2);
    stem(r,z2);
    subplot(3,1,3);
    stem(r,z);
```

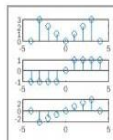Enter the time sample range of x

-3:1:3

Enter the sequence

[3 2 1 0 1 2 3]
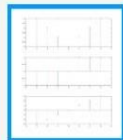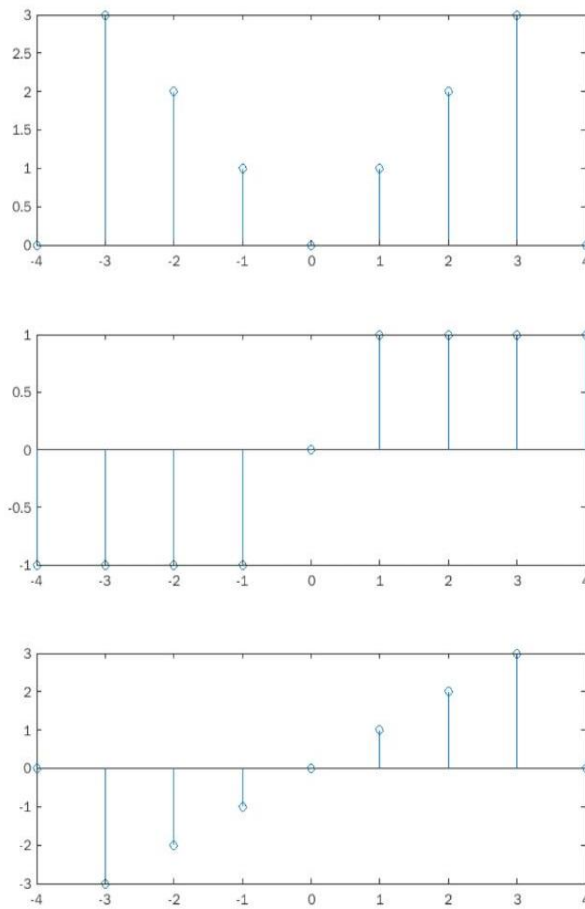
Enter the time sample range of y

-4:1:4

Enter the sequence

[-1 -1 -1 -1 0 1 1 1 1]

>> |

COMPLEX CONJUGATE

```
x=input('enter sample signal x:');
N=length(x);
X=zeros(1,N);
X2=zeros(1,N);
X1=zeros(1,N);
Y=zeros(1,N);
y=conj(x);
for k=1:N
  for n=1:N
    X(k)=X(k)+(x(n)exp(-1j*2*pi(n-1)*(k-1)/N));
    Y(k)=Y(k)+(y(n)exp(-1j*2*pi(n-1)*(k-1)/N));
  end
```

```
end
disp('Y(k)');
for k=1:N
  disp(Y(k));
end
for k=1:N
  X1(k)=X(N-k+1);
end
X2=conj(X1);
disp('[X(N-k)]*:');
for k=1:N
disp(X2(k));
end
```

```
        X1(k)=X(N-k+1);
    end
    X2=conj(X1);
    disp('[X(N-k)]*:');
    for k=1:N
    disp(X2(k));
    end

 enter sample signal x:

 [1 2 3 4 5]

 Y(k)
     15

   -2.5000 + 3.4410i

   -2.5000 + 0.8123i

   -2.5000 - 0.8123i

   -2.5000 - 3.4410i

 [X(N-k)]*:
   -2.5000 + 3.4410i

   -2.5000 + 0.8123i

   -2.5000 - 0.8123i

   -2.5000 - 3.4410i

     15
```