1.Generation of elementary signal in continuous - time

```
clc;
close all;
clear all;
```

a)Unit step function

```
t=-5:0.01:5;
step=[zeros(1,500),ones(1,501)];
subplot(3,2,1);
plot(t,step);
axis([-5 5 0 1.5]);
xlabel('Discrete time n -->');
ylabel('Amplitude-->');
title('Unit step sequence');
```

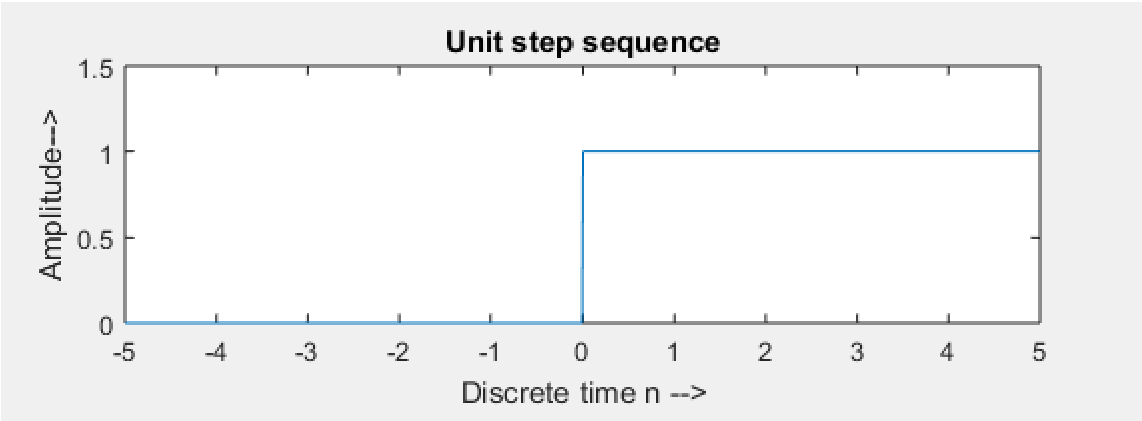


Figure1 : Unit step function

b)Unit ramp function

```
t = 0:0.01:6;
ramp=t;
subplot(3,2,2);
plot(t,ramp);
xlabel('Discrete time n -->');
ylabel('Amplitude-->');
title('Unit Ramp sequence');
```

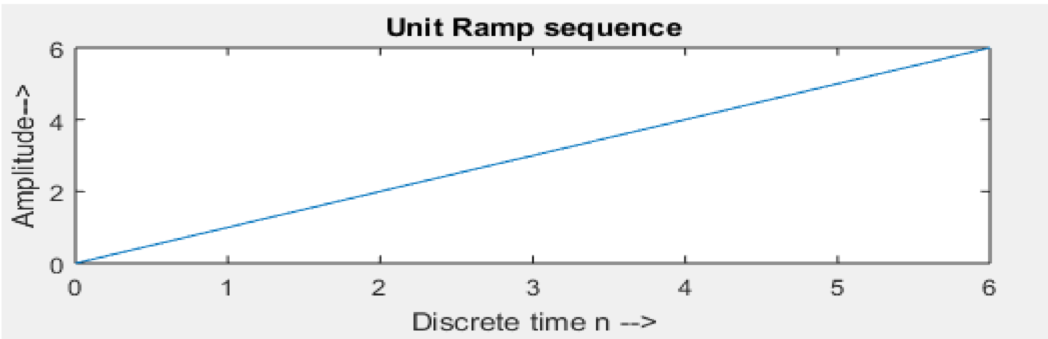


Figure2 : Unit step function

c)Unit parabolic function

```
t = 0:0.01:6;
parabola=0.5*(t.^2);
subplot(3,2,3);
plot(t,parabola);
xlabel('Discrete time n -->');
ylabel('Amplitude-->');
title('Unit Parabola sequence');
```

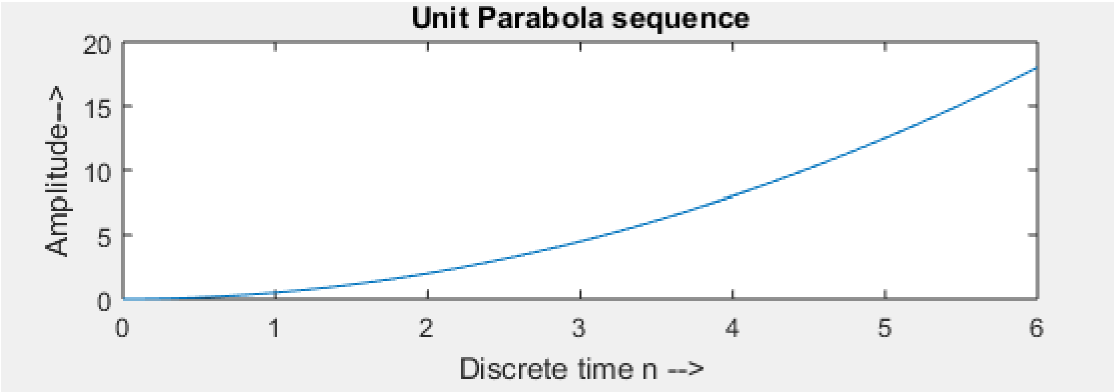


Figure3: Unit Parabola function

d)Unit impulse function

```
t =-1:0.001:1
impulse=[zeros(1,1000),ones(1,1),zeros(1,1000)];
subplot(3,2,4);
plot(t,impulse);
axis([-1 1 0 1.5]);
xlabel('Discrete time n -->');
ylabel('Amplitude-->');
title('Unit Impulse sequence');
```

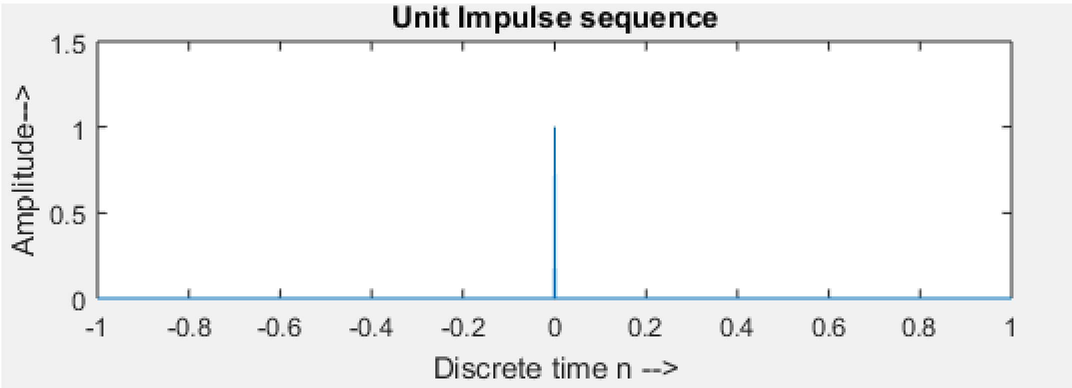


Figure4: Unit Impulse function

e) Real exponential function

```
t = -10:0.1:10;
real_ex = 2.*(1.2.^t);
subplot(3,2,5);
plot(t,real_ex);
xlabel('Discrete time n -->');
ylabel('Amplitude-->');
title('Real exponential ');
```

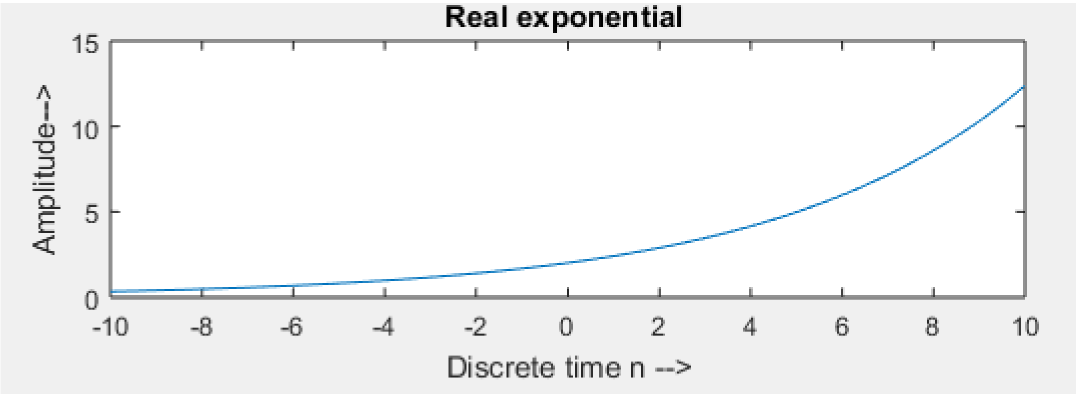


Figure5: Real exponential function

f)Complex exponential function

```
t= [0:0.1:10];
fi=exp(1i*pi/6./t);
%fi=exp(1i*pi/6.*t);
subplot(3,2,6);
plot(t,real(fi),t,imag(fi));
legend({'real','imag'})
xlabel('Discrete time n -->');
ylabel('Amplitude-->');
title('Complex exponential');
```

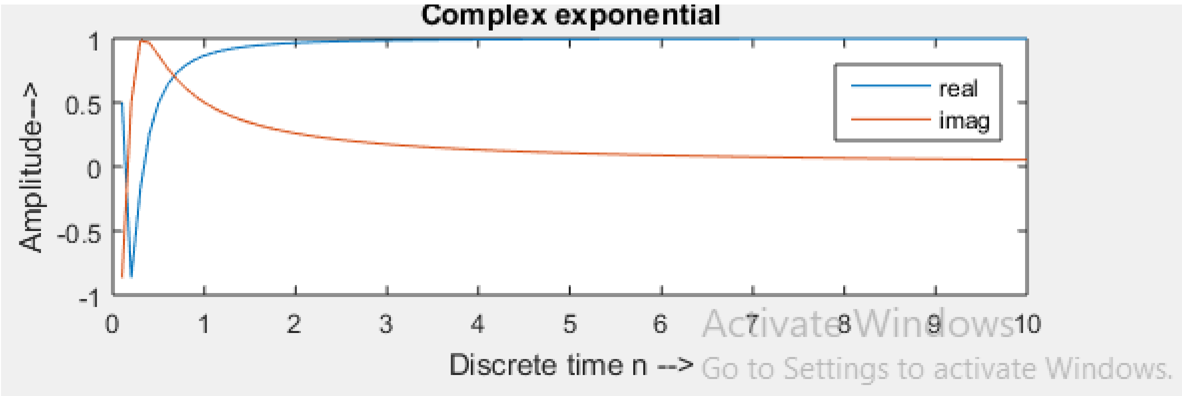


Figure6: Complex exponential function

2.Generation of elementary signal in discrete time.

```
close all;
clear all;
```

a)Unit step function

```
n = -10:1:10;
step=[zeros(1,10),ones(1,11)];
subplot(3,2,1);
stem(n,step);
xlabel('Discrete time n -->');
ylabel('Amplitude-->');
title('Unit step sequence');
axis([-10 10 0 1.2]);
```

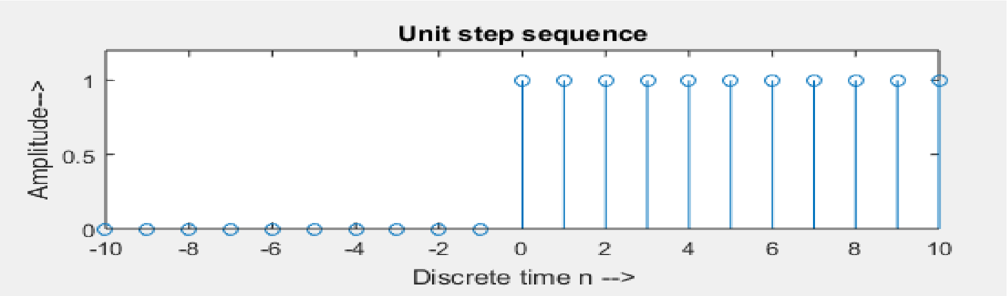


Figure7 : Unit step function

b)Unit ramp function

```
n= 0:1:10;
ramp=n;
subplot(3,2,2);
stem(n,ramp);
xlabel('Discrete time n -->');
ylabel('Amplitude-->');
title('Unit ramp sequence');
```

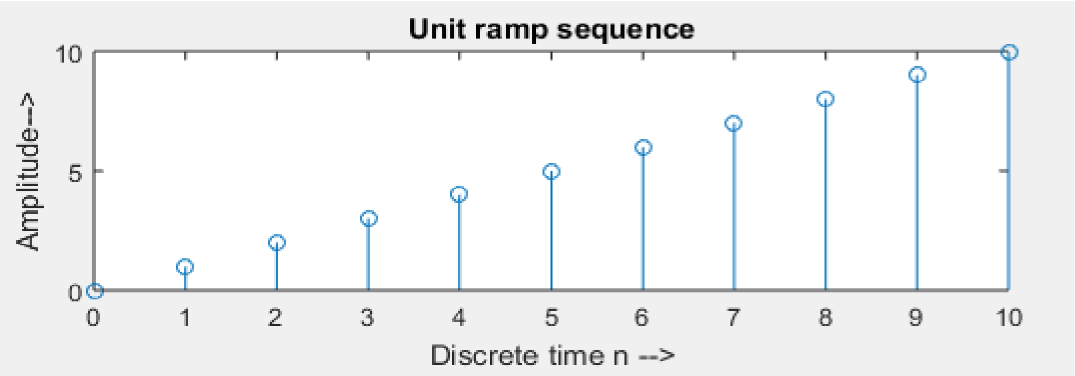


Figure8: Unit ramp function

c)Unit parabolic function

```
n = 0:1:10
parabola=0.5*(n.^2);
subplot(3,2,3);
stem(n,parabola);
xlabel('Discrete time n -->');
ylabel('Amplitude-->');
title('Unit parabolic sequence');
```

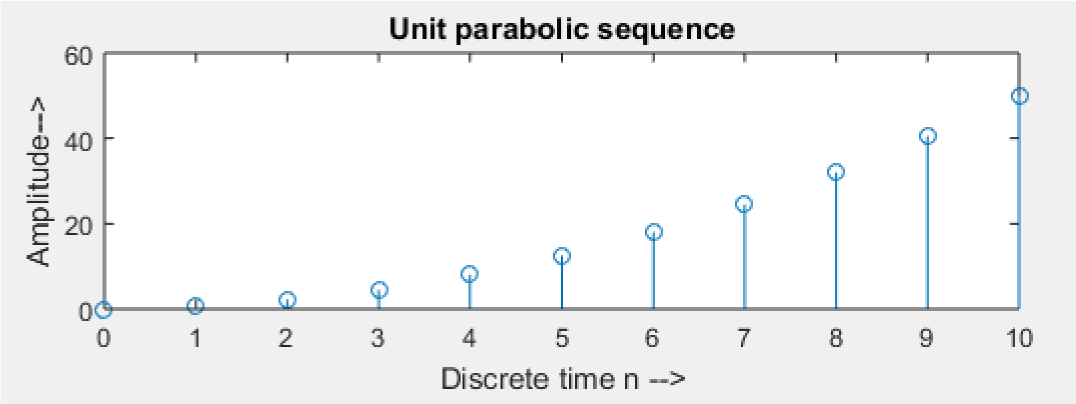


Figure9: Unit parabolic function

d)Unit impulse function

```
n=-10:1:10;
impulse=[zeros(1,10),ones(1,1),zeros(1,10)];
subplot(3,2,4);
stem(n,impulse);
xlabel('Discrete time n -->');
ylabel('Amplitude-->');
title('Unit Impulse sequence');
axis([-10 10 0 1.2]);
subplot(3,2,2);
```

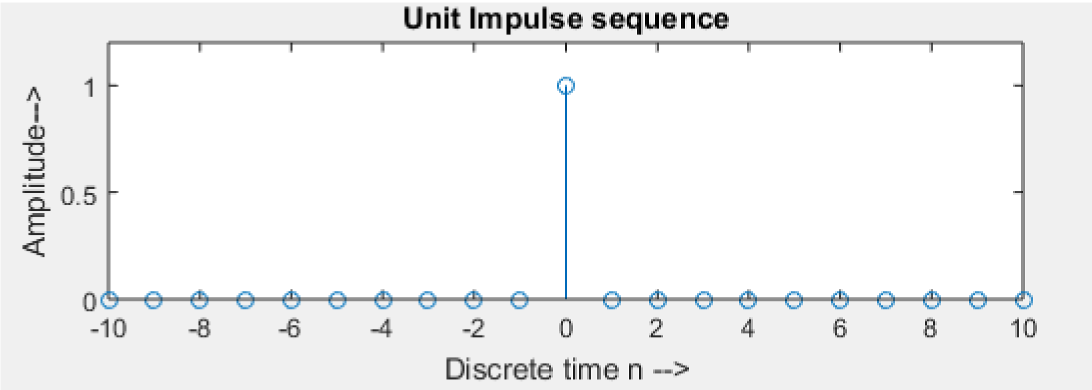


Figure10: Unit Impulse function

e)Real exponential function

```
n = -10:1:10;
%for 0<a<1
a = 0.8;
real_ex = a.^n;
subplot(3,2,5);
stem(n,real_ex);
xlabel('Discrete time n -->');
ylabel('Amplitude-->');
title('Real exponential ');
```

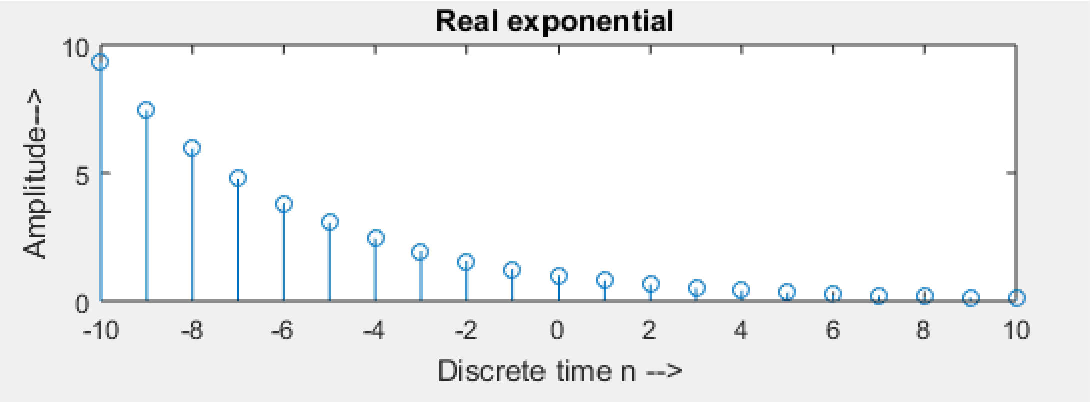


Figure11: Real exponential function

3.Genaration of following signal both in continuous and discrete time

```
clc;
close all;
clear all;
```

a)Continuous Sine function

```
t=-5:0.01:5;
y=sin(pi*t);
subplot(4,2,1);
plot(t,y);
axis([-5 5 -1 1.5]);
xlabel('Discrete time n -->');
ylabel('Amplitude-->');
title('Continuous Sine function');
```

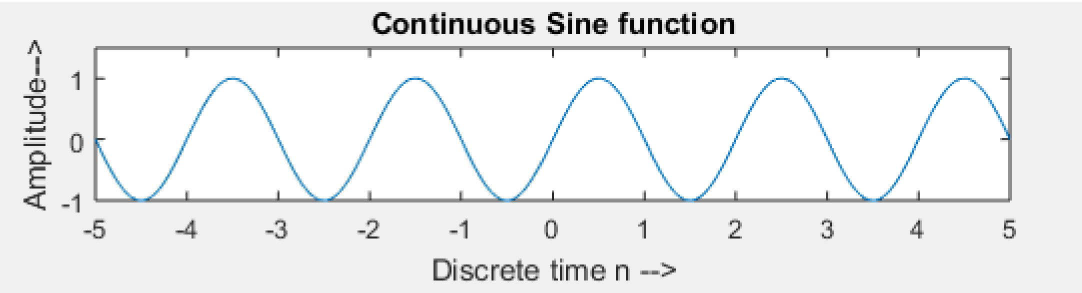
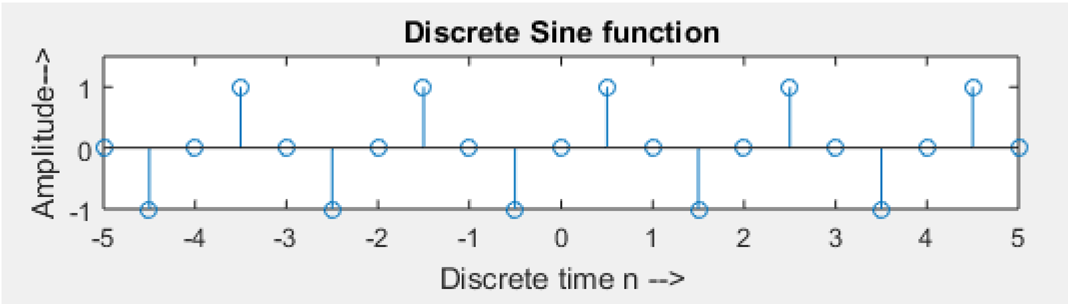


Figure12: Continuous Sine function

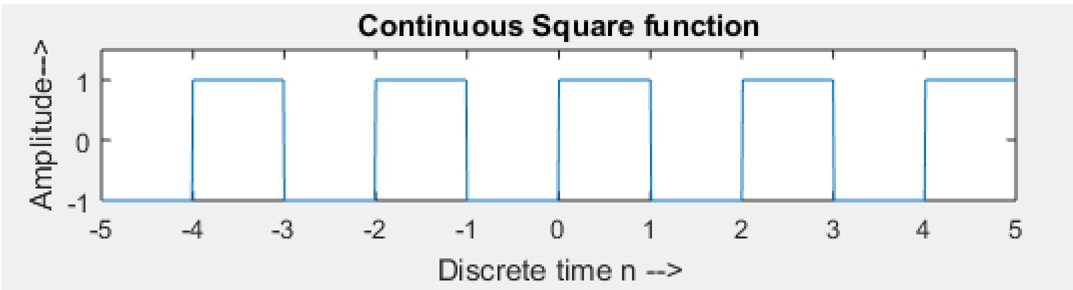
a)Discrete Sine function

```
t=-5:0.5:5;
y=sin(pi*t);
subplot(4,2,2);
stem(t,y);
axis([-5 5 -1 1.5]);
xlabel('Discrete time n -->');
ylabel('Amplitude-->');
title('Discrete Sine function');
```

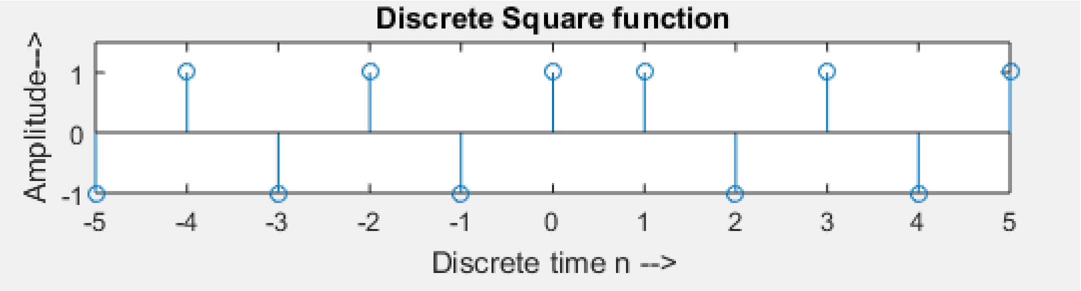


b)Continuous Square function

```
t=-5:0.01:5;
y=square(sin(pi*t));
subplot(4,2,3);
plot(t,y);
axis([-5 5 -1 1.5]);
xlabel('Discrete time n -->');
ylabel('Amplitude-->');
title('Continuous Square function');
```

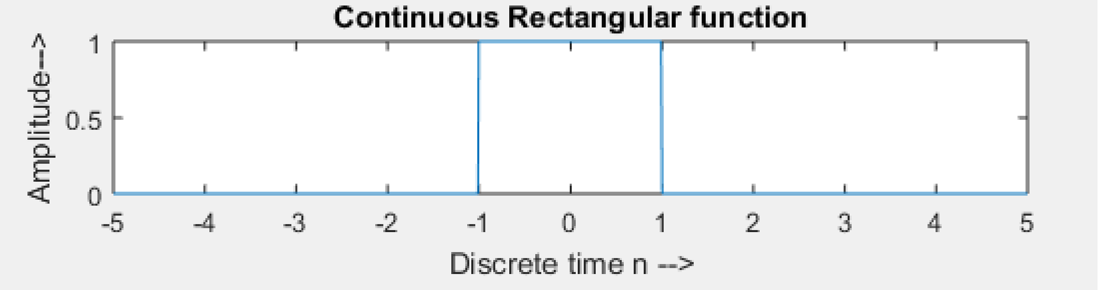



```
%Discrete Square function
t=-5:1:5;
y=square(sin(pi*t));
subplot(4,2,4);
stem(t,y);
axis([-5 5 -1 1.5]);
xlabel('Discrete time n -->');
ylabel('Amplitude-->');
title('Discrete Square function');
```

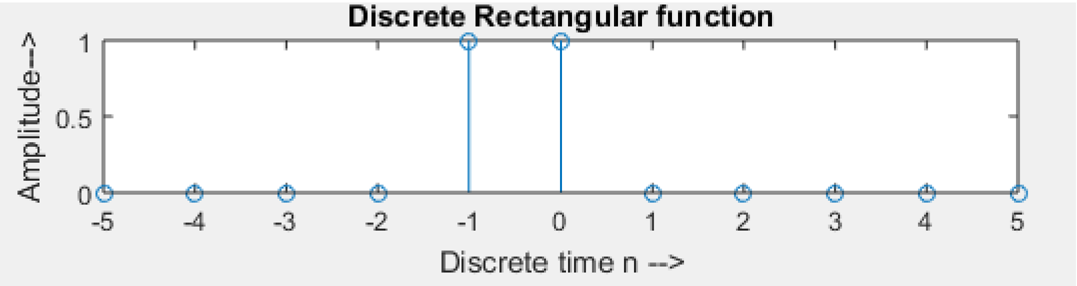


c)Continuous Rectangular function

```
t=-5:0.01:5;
width=2;
y=rectpuls(t,width);
subplot(4,2,5);
plot(t,y);
xlabel('Discrete time n -->');
ylabel('Amplitude-->');
title('Continuous Rectangular function');
```



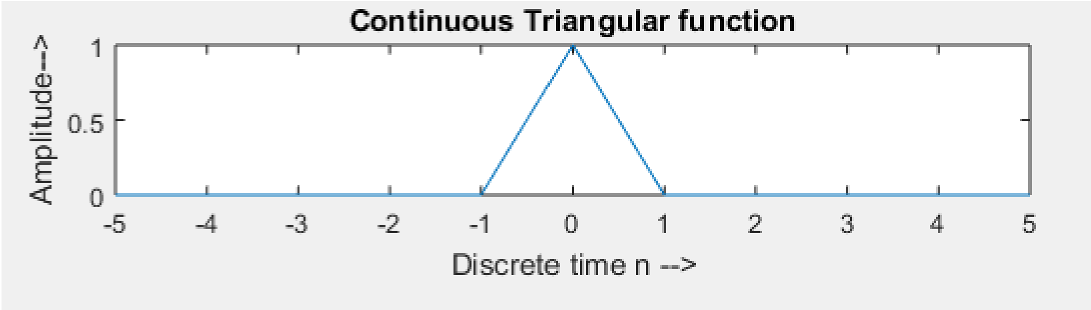

```
%Discrete Rectangular function
t=-5:5;
width=2;
y=rectpuls(t,width);
subplot(4,2,6);
stem(t,y);
xlabel('Discrete time n -->');
ylabel('Amplitude-->');
title('Discrete Rectangular function');
```



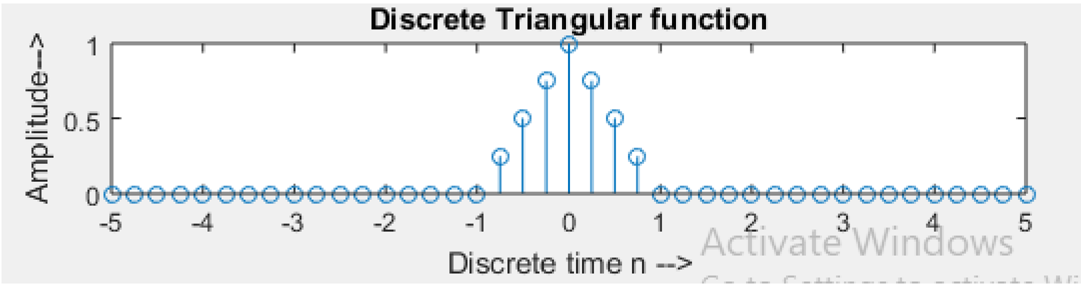
d)Continuous Triangular function

```
t = -5:0.01:5;
width=2;
y=tripuls(t,width);
subplot(4,2,7);
```

```
plot(t,y);
xlabel('Discrete time n -->');
ylabel('Amplitude-->');
title('Continuous Triangular function');
```




```
%Discrete Triangular function
t = -5:0.25:5;
width=2;
y=tripuls(t,width);
subplot(4,2,8);
stem(t,y);
xlabel('Discrete time n -->');
ylabel('Amplitude-->');
title('Discrete Triangular function');
```



8. Multiplication of following two signals(both in continuous an discrete nature)

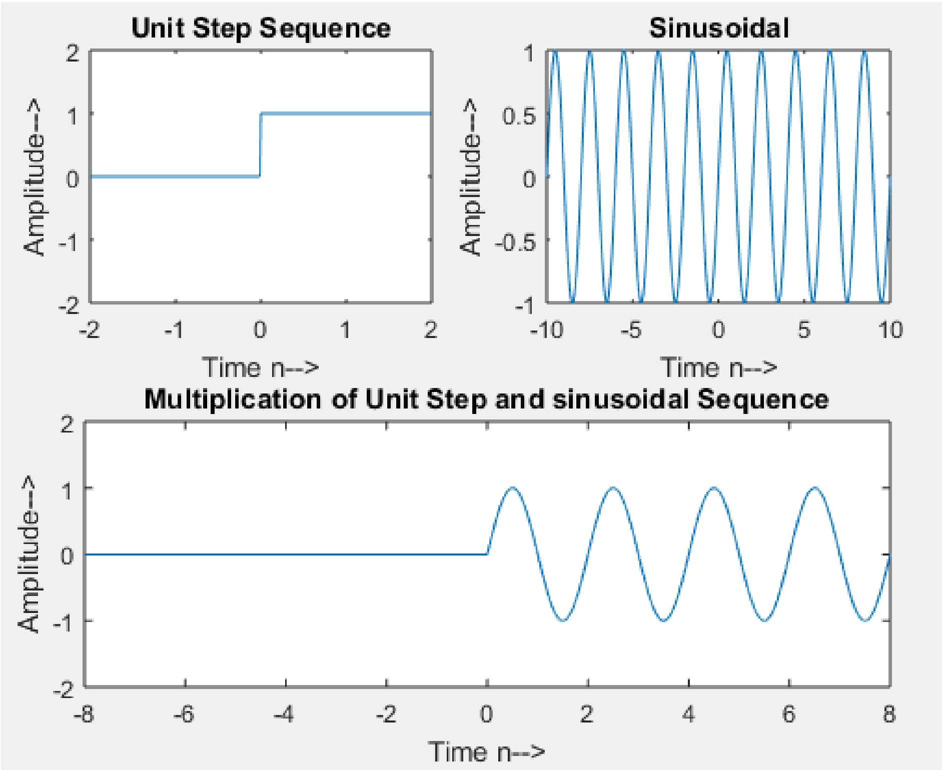
a)Unit step function and sinusoidal signal

```
t=-10:.01:10;
for i=1:length(t)
    if t(i)<0
        y(i)=0;
    else if t(i)>=0
            y(i)=1;
        end
    end
end

subplot(2,2,1);
plot(t,y);
axis([-2 2 -2 2]);
xlabel('Time n-->');
ylabel('Amplitude-->');
title('Unit Step Sequence');
```

```
s=sin(pi*t);
subplot(2,2,2);
plot(t,s);
xlabel('Time n-->');
ylabel('Amplitude-->');
title('Sinusoidal');


for i=1:length(y);
    add(i)=y(i)*s(i);
end
subplot(2,2,3:4);
plot(t,add);
axis([-8 8 -2 2]);
xlabel('Time n-->');
ylabel('Amplitude-->');
title('Multiplication of Unit Step and sinusoidal Sequence');
```



b) Unit parabolic function and Unit impulse function

```
% unit parabolic discrete sequence
n=0:1:10;
parabola=0.5*(n.^2);
subplot(3,2,1);
stem(n,parabola);
xlabel('Discrete time n------>');
ylabel('Amplitude------>');
title('unit parabolic discrete sequence');
```

```
% unit parabolic continuous sequence
n=0:1:10;
parabola=0.5*(n.^2);
subplot(3,2,2);
plot(n,parabola);
xlabel('Continuous time n------>');
ylabel('Amplitude------>');
title('unit parabolic discrete sequence');

% unit impulse discrete sequence
n=-10:1:10;
impulse=[zeros(1,10),ones(1,1),zeros(1,10)];
subplot(3,2,3);
stem(n,impulse);
xlabel('Discrete time n------>');
ylabel('Amplitude------>');
title('unit impulse discrete sequence');
axis([-10 10 0 1.2]);

% unit impulse continuous sequence
n=-10:1:10;
impulse=[zeros(1,10),ones(1,1),zeros(1,10)];
subplot(3,2,4);
plot(n,impulse);
xlabel('Continuous time n------>');
ylabel('Amplitude------>');
title('unit impulse discrete sequence');
axis([-10 10 0 1.2]);

%parabolic multiply impulse for discrete
n=-10:1:10;
for i=1:length(parabola);
    add(i)=parabola(i)*impulse(i);
end
subplot(3,2,5);
stem(n,add);
axis([-8 8 -2 2]);
xlabel('Time n-->');
ylabel('Amplitude-->');
title('Multiplication of parabola and impulse for discrete');

%parabolic multiply impulse for continuous
n=-10:1:10;
for i=1:length(parabola);
    add(i)=parabola(i)*impulse(i);
end
subplot(3,2,6);
plot(n,add);
axis([-8 8 -2 2]);
xlabel('Time n-->');
ylabel('Amplitude-->');
title('Multiplication of parabola and impulse for continuous');
```

c) Real exponential function and Rectangular signal

```
% Disctrete real exponential
n=0:10;
a=3;
x=a.^n;
subplot(3,2,1);
stem(n,x);
xlabel('Time-->');
ylabel('Amplitude-->');
title('Disctrete real exponential');

% Continuous real exponential
n=0:10;
a=3;
x=a.^n;
subplot(3,2,2);
plot(n,x);
xlabel('Time-->');
ylabel('Amplitude-->');
title('Continuous real exponential');

% discrete
f=1000;
t=-1:1/f:1;
a=rectpuls(t);
subplot(3,2,3);
stem(t,a);
xlabel('Discrete Time Period');
ylabel('Amplitude');
title('Dscrete Rectangular Signal');

% continuous
f=1000;
t=-1:1/f:1;
a=rectpuls(t);
subplot(3,2,4);
plot(t,a);
xlabel('Continuous Time Period');
ylabel('Amplitude');
title('Continuous Rectangular Signal');

%realexponential multiply rectangular for discrete
mul=x.*a;
subplot(3,2,5);
stem(mul);
title('Realexponential multiply rectangular for discrete');

%realexponential multiply rectangular for continuous
mul=x.*a;
subplot(3,2,6);
plot(mul);
title('Realexponential multiply rectangular for continuous');
```

4. Generation of sinusoidal and Gaussian signals both in continuous and discrete nature.

a) Sinusoidal signal

Sample Code:

```
t=-.05:.001:.05;
f=50;
a=3;
y=a*sin(2*pi*f*t);
subplot(2,1,1);
plot(t,y);
xlabel('amplitude');
ylabel('time');
title('sinusoidal');

t=-.05:.001:.05;
f=50;
a=3;
y=a*sin(2*pi*f*t);
subplot(2,1,2);
stem(t,y);
xlabel('amplitude');
ylabel('time');
title('sinusoidal');
```

Output:

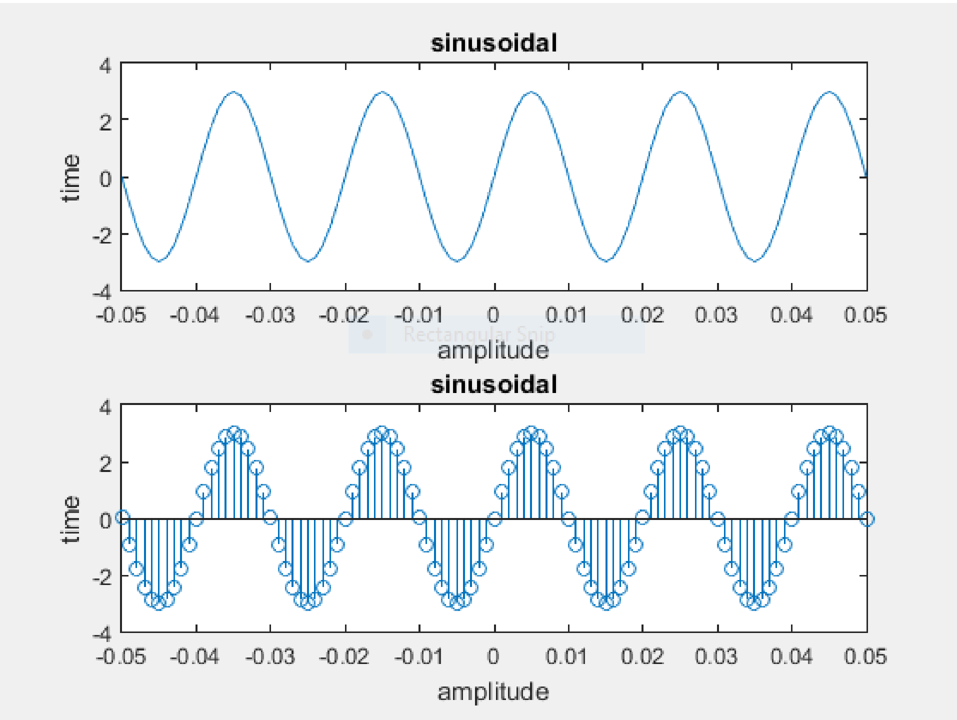


Figure : Sinusoidal signal for continuous & discrete nature

6. Addition of following two signals (both in continuous and discrete nature).

a 1) Unit step function and sinusoidal signal continuous form

Sample Code:

```
clear all;
clc;
t=-10:.01:10;

for i=1:length(t)
if t(i)<0
y(i)=0;
else if t(i)>=0
y(i) = 1;
end
end
end

subplot(2,2,1);
plot(t,y);
axis([-2 2 -2 2]);
xlabel(' time n-->');
ylabel('Amplitude-->');
title('Unit Step sequence');

s=sin(pi*t);
subplot(2,2,2);
plot(t,s);
xlabel('time');
ylabel('Amplitude');
title('sinusoidal');

for i=1:length(y)
add(i) = y(i) + s(i);
end

subplot(2,2,3:4);
plot(t,add);
axis([-8 8 -2 2]);
xlabel(' time n-->');
ylabel('Amplitude-->');
title('Addition ot unit step and sinusoidal function');
```

Output:

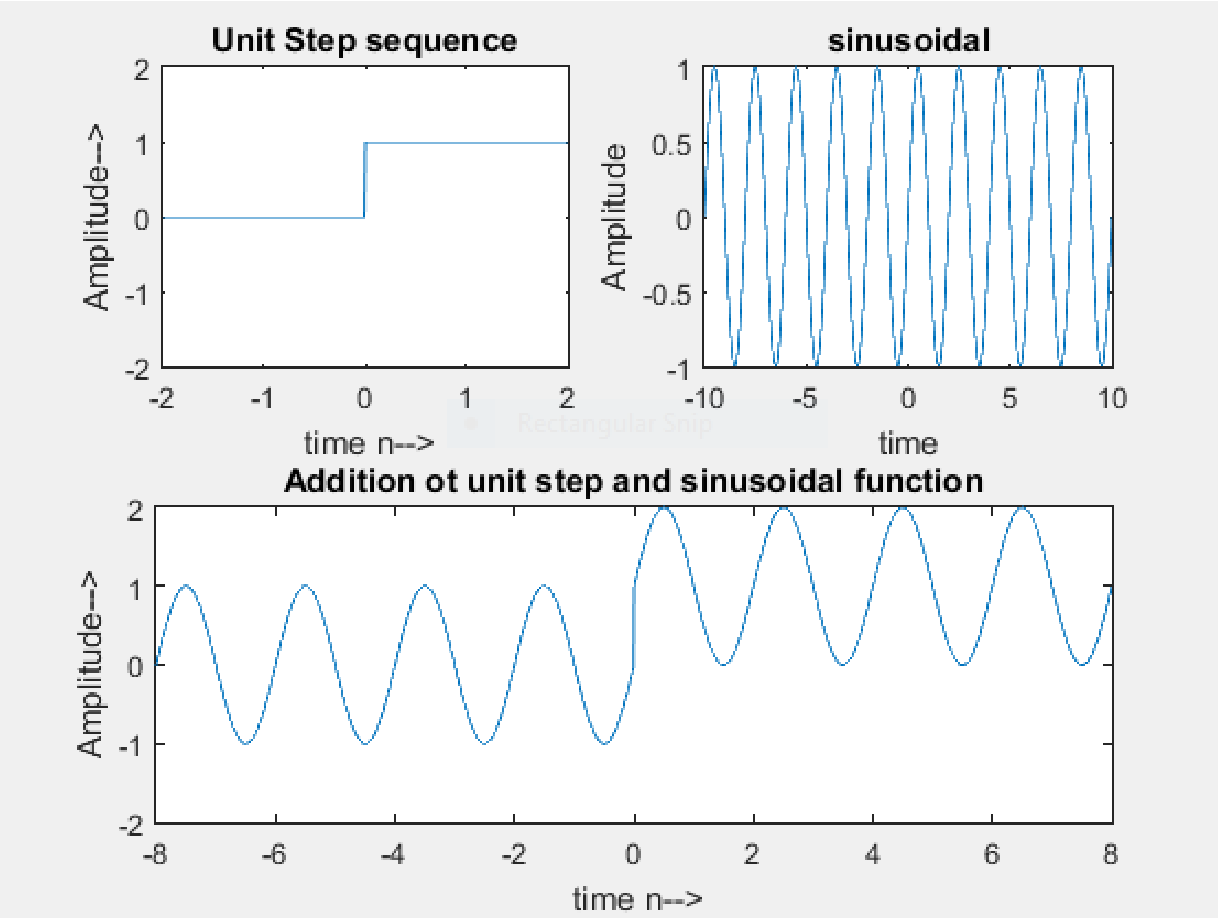


Figure : Add Unit step function and sinusoidal signal continuous form

A 2) Unit step function and sinusoidal signal discrete form

Sample Code:

```
clear all;
clc;
t=-10:.1:10;

for i=1:length(t)
    if t(i)<0
        y(i)=0;
    else if t(i)>=0
         y(i) = 1;
        end
    end
end

subplot(2,2,1);
stem(t,y);
axis([-2 2 -2 2]);
xlabel(' time n-->');
ylabel('Amplitude-->');
title('Unit Step sequence');
```

```
s=sin(pi*t);
subplot(2,2,2);
stem(t,s);
xlabel('amplitude');
ylabel('time');
title('sinusoidal');


for i=1:length(y)
    add(i) = y(i) + s(i);
end



subplot(2,2,3:4);
stem(t,add);
axis([-8 8 -2 2]);
xlabel(' time n-->');
ylabel('Amplitude-->');
title('Addition of unit step and sinusoidal function');
```

Output:

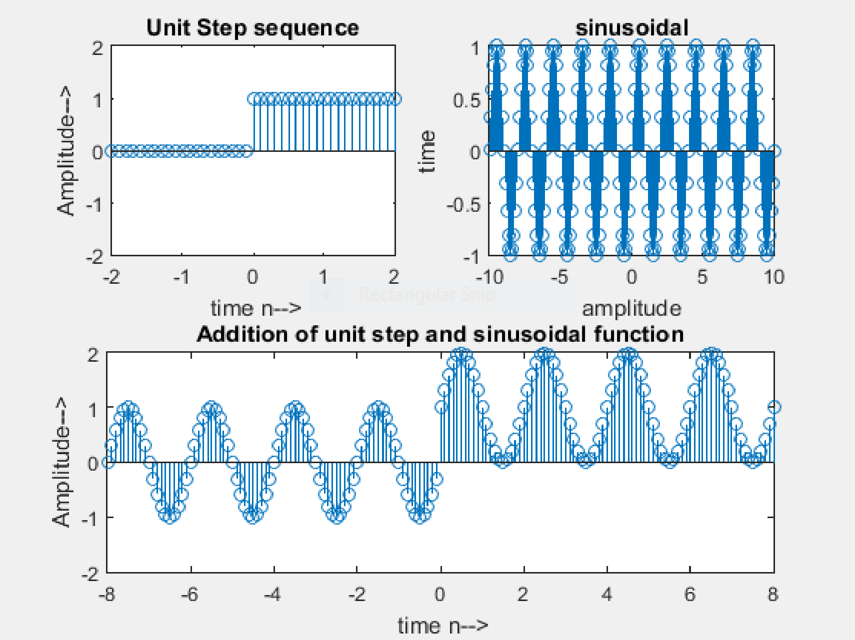


Figure : Add Unit step function and sinusoidal signal discrete form

b 1) Unit parabolic function & unit impulse function continuous form

Sample Code:

```
clear all;
clc;
t=-10:.01:10;
parabola=.5*(t.^2);
subplot(2,2,1);
plot(t,parabola);
xlabel(' time n-->');
ylabel('Amplitude-->');
title('Unit Parabola sequence');
```

```
for i=1:length(t)
    if t(i)<0
        y(i)=0;
    else if t(i)==0
         y(i) = 1;
        else if t(i)>0
                y(i)=0;
            end
        end
    end
end

subplot(2,2,2);
plot(t,y);
xlabel(' time n-->');
ylabel('Amplitude-->');
title('Unit Impulse sequence');

for i=1:length(y)
    add(i) = parabola(i)+y(i);
end


subplot(2,2,3:4);
plot(t,add);
xlabel(' time n-->');
ylabel('Amplitude-->');
axis([-2 2 0 1]);
title('Addition ot unit parabolic and impulse function');
```

Output:

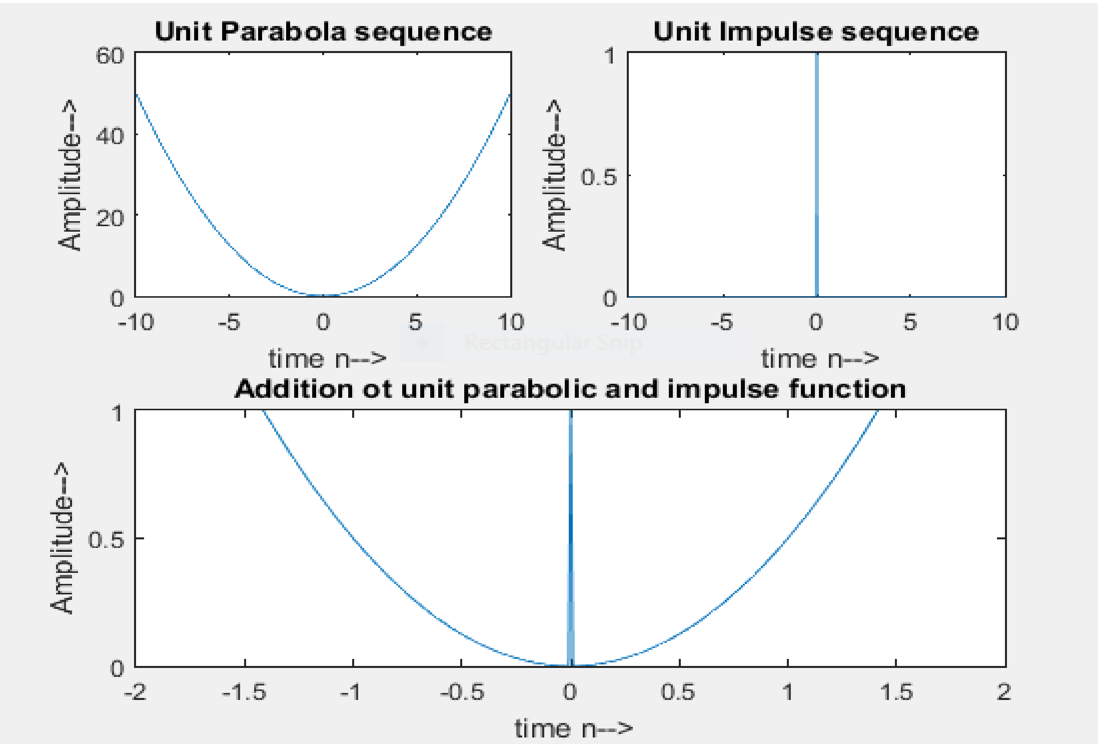


Figure :Add Unit parabolic function & unit impulse function continuous form

b 1) Unit parabolic function & unit impulse function discrete form

Sample Code:

```
clear all;
clc;
t=-10:.1:10;
parabola=.5*(t.^2);
subplot(2,2,1);
stem(t,parabola);
xlabel(' time n-->');
ylabel('Amplitude-->');
title('Unit Parabola sequence');


for i=1:length(t)
    if t(i)<0
        y(i)=0;
    else if t(i)==0
         y(i) = 1;
        else if t(i)>0
                y(i)=0;
            end
        end
    end
end

subplot(2,2,2);
stem(t,y);
xlabel(' time n-->');
ylabel('Amplitude-->');
title('Unit Impulse sequence');

for i=1:length(y)
    add(i) = parabola(i)+y(i);
end


subplot(2,2,3:4);
stem(t,add);
xlabel(' time n-->');
ylabel('Amplitude-->');
axis([-2 2 0 1]);
title('Addition of unit parabolic and impulse function');
```

Output:

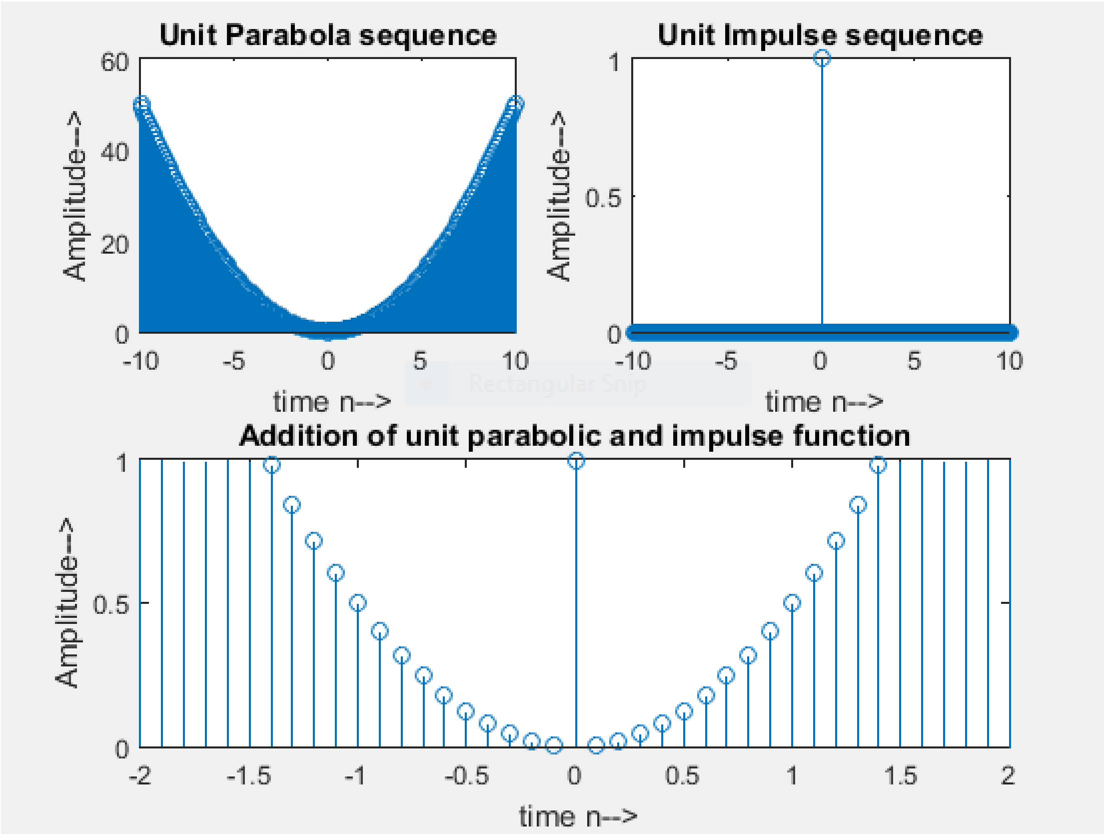


Figure :Add Unit parabolic function & unit impulse function discrete form

c 1) Real exponential function & Rectangular signal

Sample Code:

```
f=1000;
n=-10:.1/f:10;
a=3;
x=a.^n;
subplot(2,2,1);
plot(n,x);
xlabel('time-->');
ylabel('amplitude-->');
title(' Continuous real exponential');

y=rectpuls(n);
subplot(2,2,2);
plot(n,y);
title('Continuous rectangular');

for i=1:length(x)
    add(i)=x(i)+y(i);
end
subplot(2,2,3:4);
plot(n,add);
axis([-4 4 -2 2]);
xlabel(' time n-->');
ylabel('Amplitude-->');
```

```
title('Addition  real exponential and rectangular function');
```

Output:

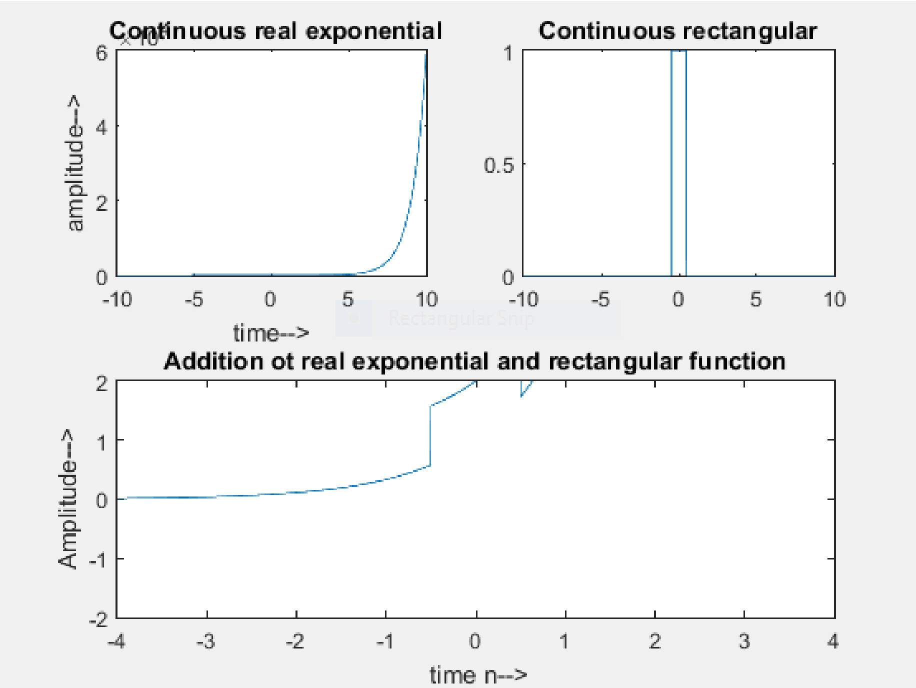


Figure : Add Real exponential function & Rectangular signal continuous form

c 2) Real exponential function & Rectangular signal discrete form

Sample Code:

```
f=1000;
n=-10:.1/f:10;
a=3;
x=a.^n;
subplot(2,2,1);
stem(n,x);
xlabel('time-->');
ylabel('amplitude-->');
title(' Continuous real exponential');

y=rectpuls(n);
subplot(2,2,2);
stem(n,y);
title('Continuous rectangular');

for i=1:length(x)
    add(i)=x(i)+y(i);
end
subplot(2,2,3:4);
stem(n,add);
axis([-4 4 -2 2]);
xlabel(' time n-->');
ylabel('Amplitude-->');
title('Addition ot real exponential and rectangular function');
```

Output:

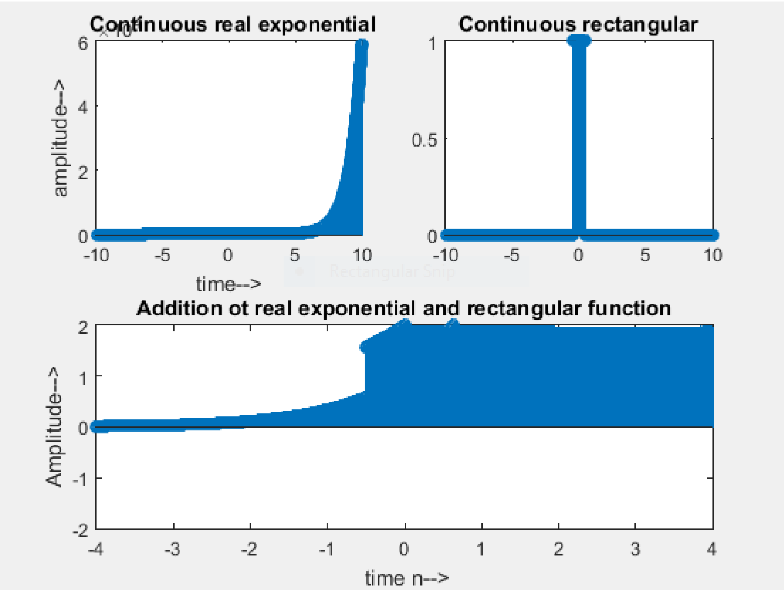


Figure : Add Real exponential function & Rectangular signal discrete form

d) complex exponential function & triangular signal

Sample Code:

```
% Disctrete complex exponential
n=-1:.001:1;
a=2;
cexp=exp((a+3j)*n);
subplot(3,2,1);
stem(n,cexp);
xlabel('Time');
ylabel('Amplitude');
title('Disctrete complex exponential');

% Continuous complex exponential
t=-1:.001:1;
a=2;
cexp=exp((a+3j)*t);
subplot(3,2,2);
plot(t,cexp);
xlabel('Time');
ylabel('Amplitude');
title('Continuous complex exponential');

% discrte triangular function
%f2=100;
%t2=-1:1/f:1;
n=-1:.001:1;
tri=tripuls(n);
subplot(3,2,3);
stem(n,tri);
xlabel('Discrete');
ylabel('Amplitude');
```

```
title('Triangular Signal');

% continuous triangular function
%f=100;
%t=-1:1/f:1;
t=-1:.001:1;
tri=tripuls(t);
subplot(3,2,4);
plot(t,tri);
xlabel('Continuous');
ylabel('Amplitude');
title('Triangular Signal');

% addition of complexExponential and trinangular function(discrete time)
for i=1:length(cexp)
    add(i)=cexp(i)+tri(i);
end
subplot(3,2,5);
stem(n,add);
xlabel('Discrete Time');
ylabel('Amplitude');
title('ComplexExponential + Triangular');

% addition of complexExponential and trinangular function(continuous time)
for i=1:length(cexp)
    add(i)=cexp(i)+tri(i);
end
subplot(3,2,6);
plot(t,add);
xlabel('Continuous Time');
ylabel('Amplitude');
title('ComplexExponential + Triangular');
```

Output:

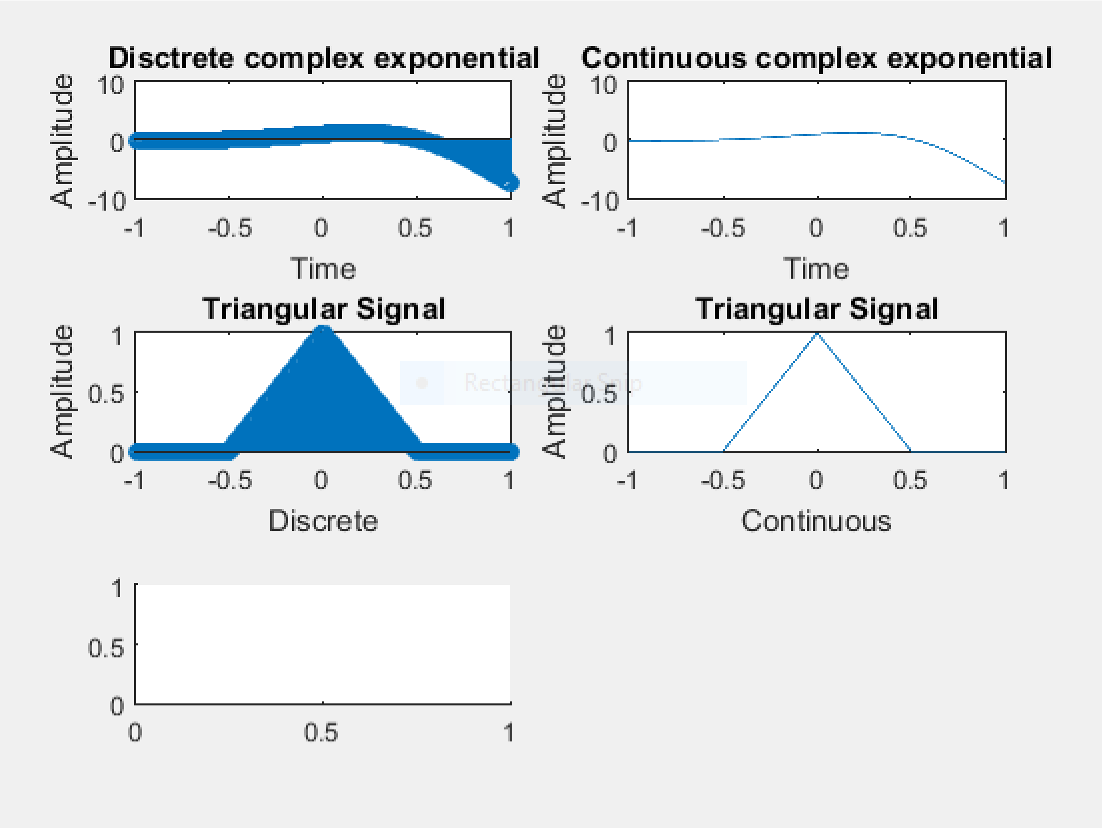


Figure : Add complex exponential & triangular signal

35.Find the autocorrelation function of the sequence

a)x(n)= sin(n)

b)x(n)=[1,2,3,4]

Sample Code:

```
clc;
clear all;
close all;
% x(n)=sin(n);
n=0:1:10;
x1=sin(n);
y1=xcorr(x1);
subplot(2,1,1);
stem(y1);
xlabel('n');
ylabel('y1(n)');
title('autocorrelation of x(t)=sin(t)');

% x(n)=[1,2,3,4]
n=0:1:3;
x2=[1 2 3 4];
y2=xcorr(x2);
subplot(2,1,2);
stem(y2);
```

```
xlabel('n');
ylabel('y2(n)');
title('autocorrelation of x(n)=[1,2,3,4]');
```

Output:

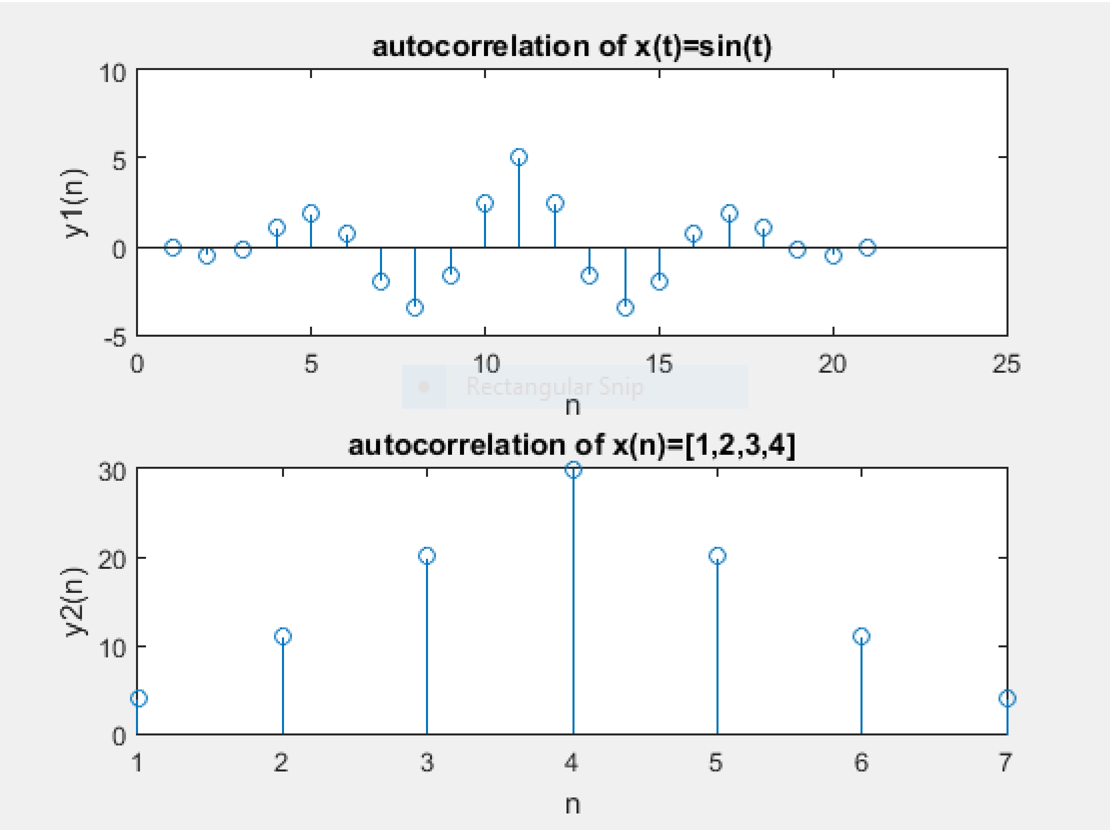


Figure : autocorrelation function of the sequence

9. Multiplication of any two or more types of signals (both in continuous and discrete nature)

Sample code:

```
%x1(t)=5exp(-at) for discrete;
t=0:0.001:5;
a=1.2;
x1=5*exp(-a*t);
subplot(3,2,1);
stem(t,x1);
title('First signal x1(t) for discrete');

%x1(t)=5exp(-at) for continuous;
t=0:0.001:5;
a=1.2;
x1=5*exp(-a*t);
subplot(3,2,2);
plot(t,x1);
title('First signal x1(t) for continuous');
```

```
%x2(t)=2sin(wt) for discrete;
f=1;
x2=2*sin(2*pi*f*t);
subplot(3,2,3);
stem(t,x2);
title('Second signal x2(t) for discrete');

%x2(t)=2sin(wt) for continuous;
f=1;
x2=2*sin(2*pi*f*t);
subplot(3,2,4);
plot(t,x2);
title('Second signal x2(t) for continuous');

%Multiplication of x1(t) and x2(t) for discrete
y=x1.*x2;
subplot(3,2,5);
stem(t,y);
title('Multiplication of x1(t) and x2(t) for discrete');


%Multiplication of x1(t) and x2(t) for continuous
y=x1.*x2;
subplot(3,2,6);
plot(t,y);
title('Multiplication of x1(t) and x2(t) for continuous');
```

Output:

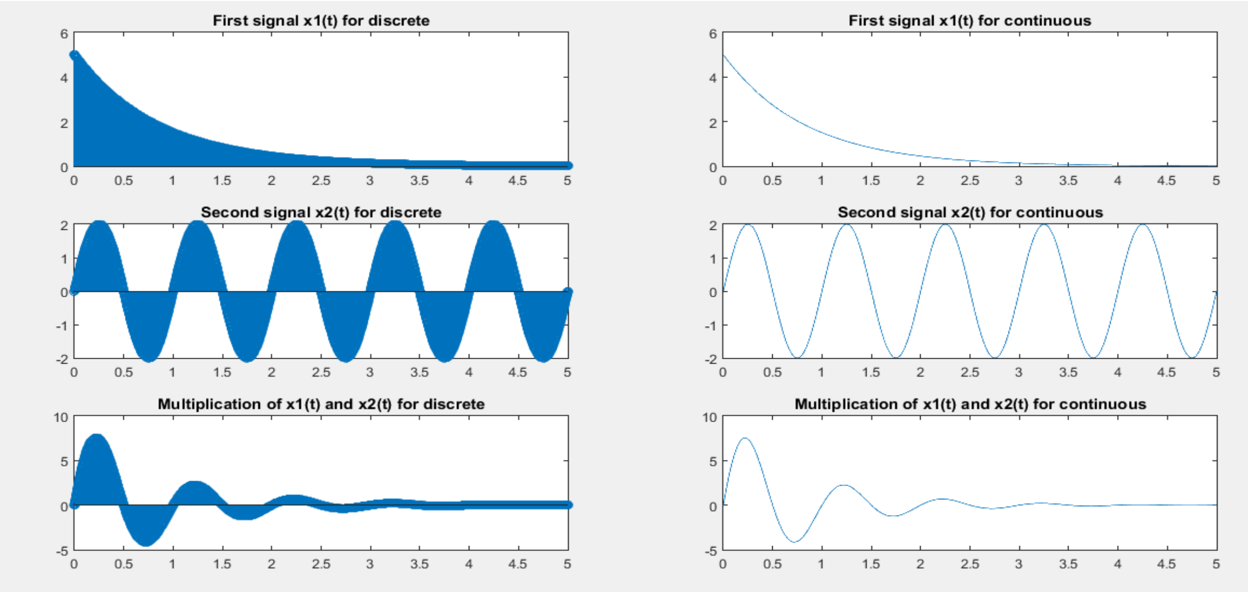


Figure: Multiplication of any two or more types of signals (both in continuous and discrete nature)

10. Show the delayed and advanced version for the following signal

a) Unit step function:

Sample code:

```
% unit step continuous sequence
n=-10:1:10;
step=[zeros(1,10),ones(1,11)];
subplot(2,2,1);
plot(n,step);
xlabel('Continuous time n------>');
ylabel('Amplitude------>');
title('unit step discrete sequence');
axis([-10 10 0 1.2]);
```

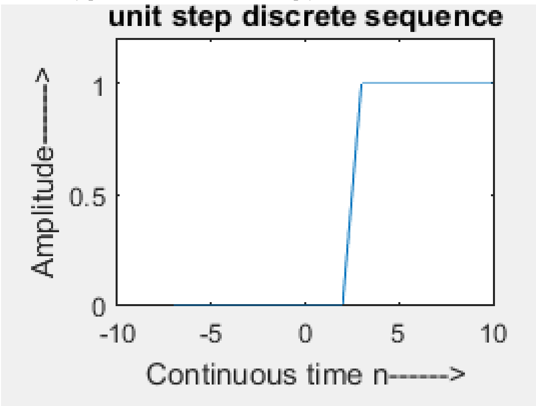


Figure: Unit step function

```
% unit step continuous sequence
n=-10:1:10;
step=[zeros(1,10),ones(1,11)];
subplot(2,2,2);
plot(n-3,step);
xlabel('Continuous time n------>');
ylabel('Amplitude------>');
title('unit step discrete sequence');
axis([-10 10 0 1.2]);
```

Figure: Delayed version of unit step function

```
% unit step continuous sequence
n=-10:1:10;
step=[zeros(1,10),ones(1,11)];
subplot(2,2,3);
plot(n+3,step);
xlabel('Continuous time n------>');
ylabel('Amplitude------>');
title('unit step discrete sequence');
axis([-10 10 0 1.2]);
```

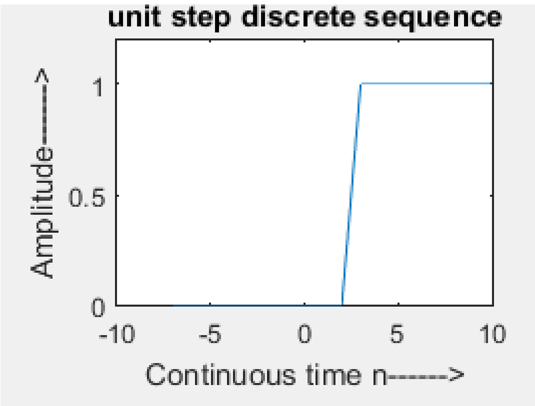


Figure: Advanced version of unit step function

11. Show the compressed and expanded version for all signals by applying the time scaling operation in the output of addition of following two signals:

a) Unit step function and sinusoidal signal:

Sample code:

```
clear all;
clc;
t=-10:.01:10;

for i=1:length(t)
    if t(i)<0
        y(i)=0;
    else if t(i)>=0
         y(i) = 1;
        end
    end
end

subplot(2,3,1);
plot(t,y);
axis([-2 2 -2 2]);
xlabel(' time n-->');
ylabel('Amplitude-->');
title('Unit Step sequence');

s=sin(pi*t);
subplot(2,3,2);
plot(t,s);
xlabel('amplitude');
```

```
ylabel('time');
title('sinusoidal');

 for i=1:length(y)
    add(i) = y(i) + s(i);
end
subplot(2,3,3);
plot(t,add);
axis([-8 8 -2 2]);
xlabel(' time n-->');
ylabel('Amplitude-->');
title('Addition of unit step and sinusoidal function');

subplot(2,3,4);
plot(2*t,add);
axis([-20 20 -2 2]);
xlabel(' time n-->');
ylabel('Amplitude-->');
title('Expanded of unit step and sinusoidal function');

subplot(2,3,5);
plot(t/2,add);
axis([-8 8 -2 2]);
xlabel(' time n-->');
ylabel('Amplitude-->');
title('Compressed of unit step and sinusoidal function');
```

Output:

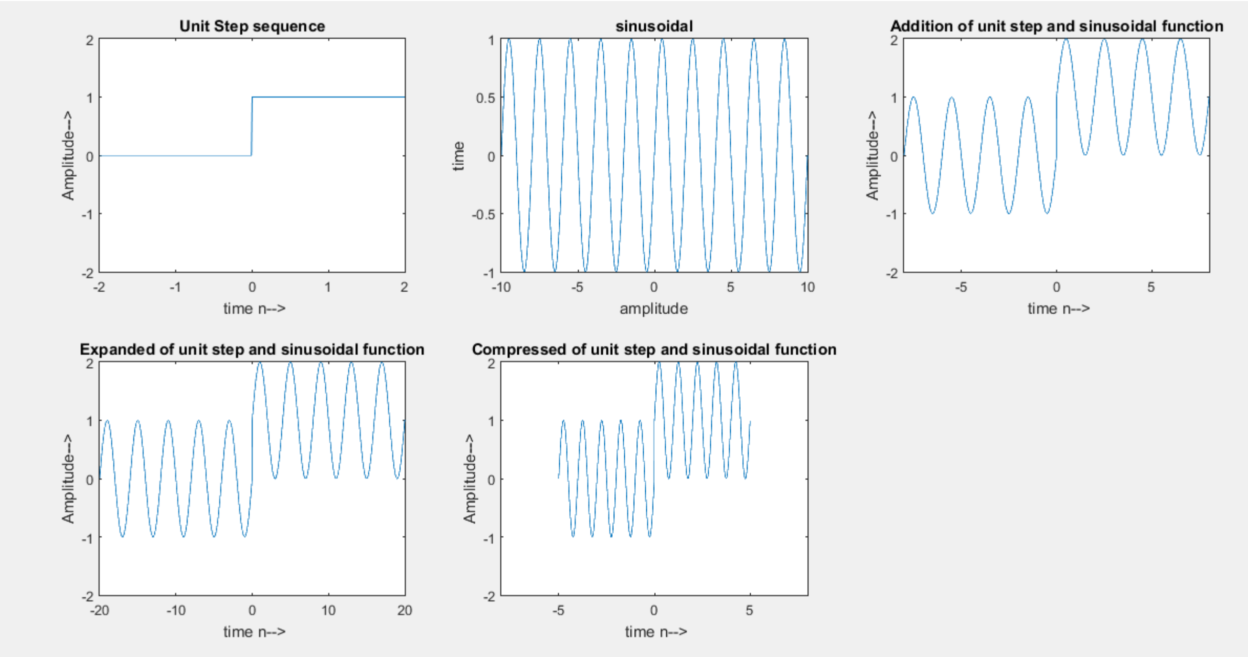


Figure: Compressed and expanded version of the signal of addition of unit step and sinusoidal function

b) Unit parabolic function and unit impulse function:

Sample code:

```
clear all;
clc;
t=-10:.01:10;
parabola=.5*(t.^2);
subplot(3,2,1);
plot(t,parabola);
xlabel(' time n-->');
ylabel('Amplitude-->');
title('Unit Parabola sequence');


for i=1:length(t)
    if t(i)<0
        y(i)=0;
    else if t(i)==0
         y(i) = 1;
        else if t(i)>0
                y(i)=0;
            end
        end
    end
end

subplot(3,2,2);
plot(t,y);
xlabel(' time n-->');
ylabel('Amplitude-->');
title('Unit Impulse sequence');

for i=1:length(y)
    add(i) = parabola(i)+y(i);
end


subplot(3,2,3);
plot(t,add);
xlabel(' time n-->');
ylabel('Amplitude-->');
axis([-2 2 0 1]);
title('Addition of unit parabolic and impulse function');

subplot(3,2,4);
plot(2*t,add);
xlabel(' time n-->');
ylabel('Amplitude-->');
axis([-4 4 0 1]);
title('Expanded of unit parabolic and impulse function');

subplot(3,2,5);
plot(t/2,add);
xlabel(' time n-->');
ylabel('Amplitude-->');
axis([-4 4 0 1]);
title(' Compressed of unit parabolic and impulse function');
```

Output:

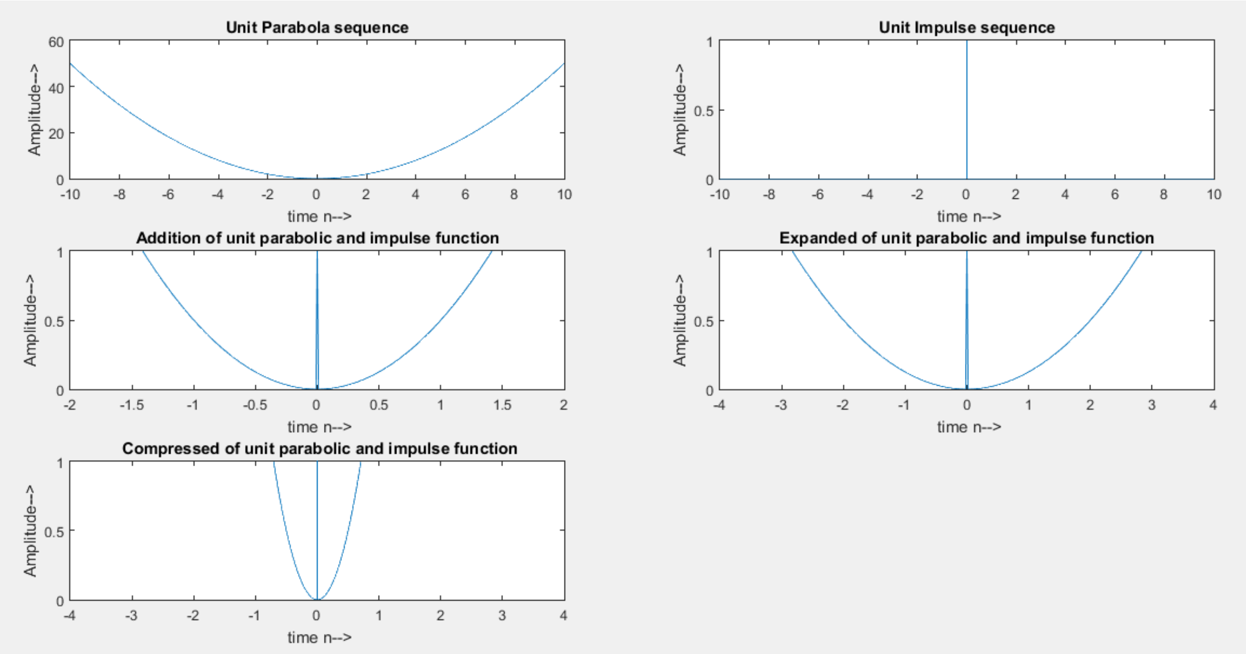


Figure: Compressed and expanded version of the signal of addition of unit parabolic function and unit impulse function

13. Generation of discrete-time sequence of the following:

```
x(n)= u(n+3)+ 5u(n-15)+4u(n+10);
```

Sample code:

```
n = -20:1:20;
u=[zeros(1,20),ones(1,21)];
u1= [zeros(1,17),ones(1,24)];
u2=[zeros(1,35),ones(1,6)];
u2 = 5*u2;
u3=[zeros(1,10),ones(1,31)];
u3 = 4*u3;
x=u1+u2+u3;
subplot(3,3,1);
plot(n,u);
subplot(3,3,2);
plot(n,u1);
subplot(3,3,3);
title('Figure u2');
plot(n,u2);
subplot(3,3,4);
plot(n,u3);
subplot(3,3,5);
plot(n,x);
subplot(3,3,6);
stem(n,u1);
subplot(3,3,7);
stem(n,u2);
subplot(3,3,8);
stem(n,u3);
```

```
subplot(3,3,9);
stem(n,x);
```

Output:

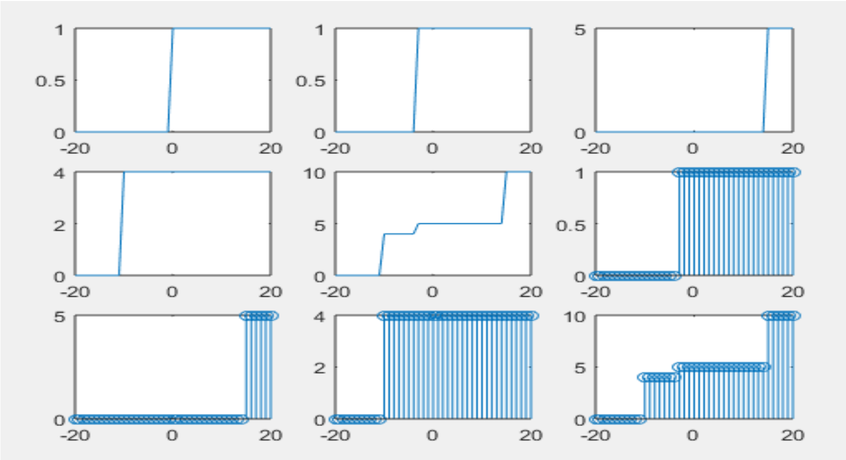


Figure: Given discrete-time sequence

14. Find even and odd component of a continuous time signal.

Sample Code:

```
t= -10:.01:10;
u = .5*sign(t)+0.5;
x = exp(-2*t).*u;
subplot(3,2,1);
stem(t,x);
x1= fliplr(x);
subplot(3,2,2);
stem(t,x1);

%even signal
xe = .5*(x+x1);
subplot(3,2,3);
stem(t,xe);
title('Even signal');

%odd signal
xo = .5*(x-x1);
subplot(3,2,4);
stem(t,xo);
title('Odd signal');
```

Output:

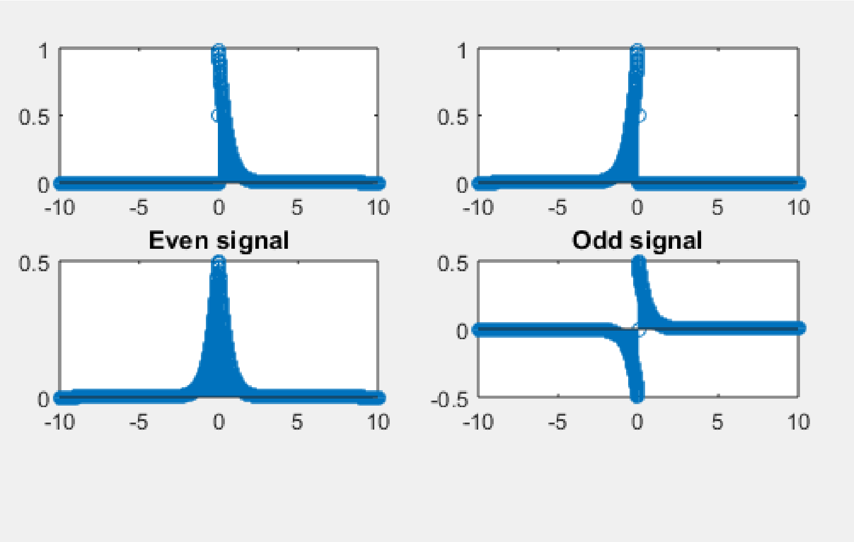


Figure: Even and odd components of given continuous -time signal

15.Evaluate even and odd components of any signal.

Sample Code:

```
t = -10:.01:10;
%actual function
u = .5*sign(t)+.5;
x1 = exp(-.5*t).*u;
subplot(4,1,1);
stem(t,x1);
x2 = fliplr(x1);
subplot(4,1,2);
stem(t,x2);
%EVEN
x3 = .5*(x1+x2);
subplot(4,1,3);
stem(t,x3);
title('Even signal');

%odd
x4 = .5*(x1-x2);
subplot(4,1,4);
stem(t,x4);
title('Odd signal');
```

Output:

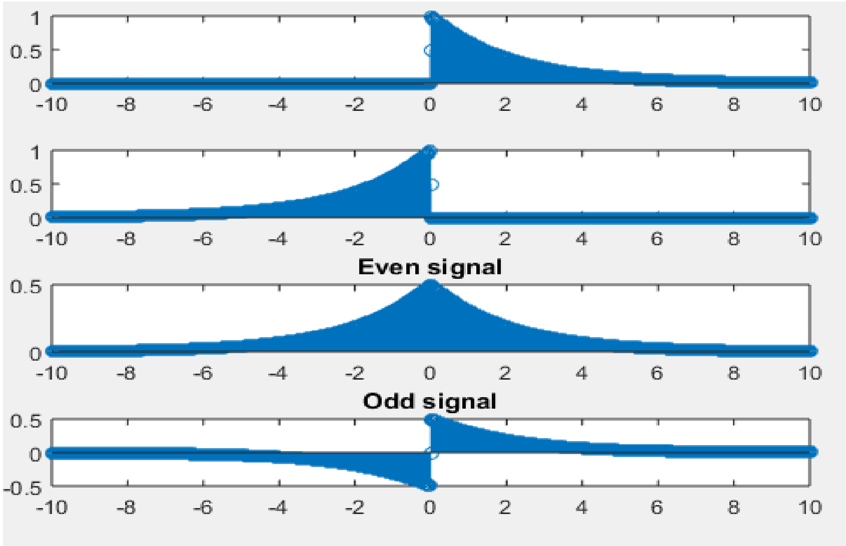


Figure: Even and odd components of a signal

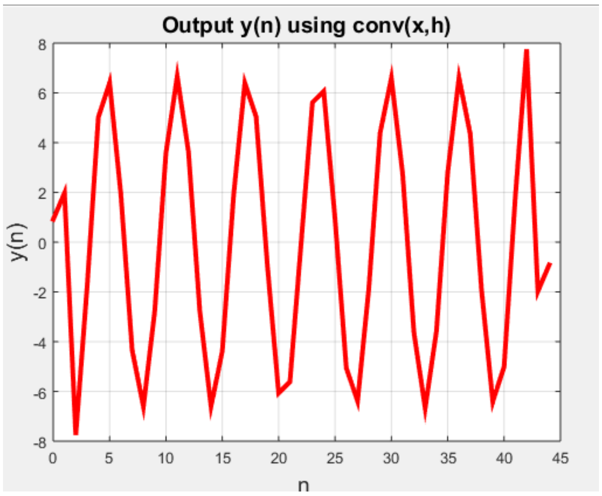
16. Find linear convolution of two discrete-time sequence.

Sample Code:

```
n = -20:20;
x = sin(n);
h = [-1,-2,8,-2,-1];
N = length(x);
M = length(h);
Ny = N + M -1;
y = zeros(1,Ny);
for i = 1:N
      for k = 1:M
       y(i+k-1) = y(i+k-1) + h(k)*x(i);
      end
end
m = 0: Ny-1;
% Make plot
figure
plot(m,y,'linewidth',3,'color','m')
grid;
a = title('Output of an LTI System y(n)');
set(a,'fontsize',14);
a = ylabel('y(n)');
set(a,'Fontsize',14);
a = xlabel('n');
set(a,'Fontsize',14);
% Using matlab built in function (you get the same results)
figure
y2 = conv(x,h);
plot(m,y2,'linewidth',3,'color','r')
grid;
a = title('Output y(n) using conv(x,h)');
set(a,'fontsize',14);
```

```
a = ylabel('y(n)');
set(a,'Fontsize',14);
a = xlabel('n ');
set(a,'Fontsize',14);
```

Output:



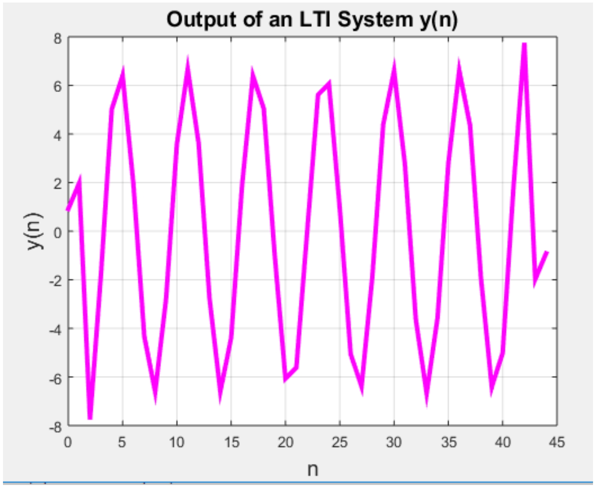


Figure: Linear convolution of two discrete-time sequence

28. Find Fourier Transform and Inverse Fourier Transform of a given signal.

Sample code:

```
syms t;
f=exp(-t^2);
subplot(3,1,1);
disp('Input signal is:');
disp(f);

%Fourier transform
FT=fourier(f);
disp('Fourier transform of signal is:');
disp(FT);

%Fourier inverse transform
IFT=ifourier(FT);
disp('Inverse Fourier transform of signal is:');
disp(IFT);
```

Output:

Given equation is:

exp(-t^2)

Fourier equation of given equation is:

pi^(1/2)*exp(-w^2/4)

Inverse fourier equation of given signal is:

exp(-x^2/4)/(2*pi^(1/2))

29. Fourier transform of a rectangular pulse.

Sample Code:

```
syms t w
%input signal x(t)
x=2*(heaviside(t+2)-heaviside(t-2));
subplot(3,1,1);
ezplot(x,[-2,2]);
axis([-2.5 2.5 0 2.5]);

%fourier transform
x=int(x*exp(-1i*w*t),t,-5,5);
x1=simplify(x);
disp('The fourier trnsform of x(t) is :');
disp(x1);

subplot(3,1,2);
ezplot(x1);
%magnitude response
x2=sqrt((real(x1).^2)+(imag(x1).^2));
subplot(3,1,3);
ezplot(x2);
```

Output:

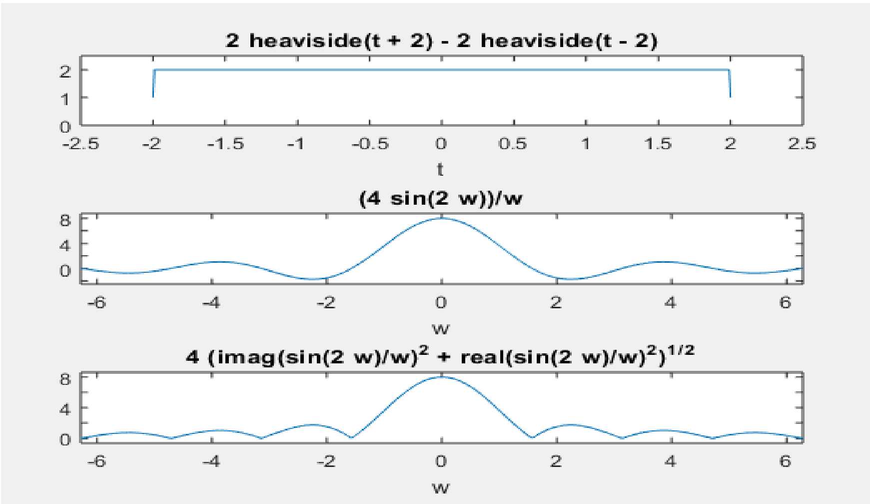


Figure: Fourier transform of a rectangular pulse.

38. Generation of z transform and inverse z transform of a sequence.

Sample Code:

```
without built in function new
y=[1 2 3 4 5];
display('Display input');
disp(y);
Y=0;
len=length(y);
z=sym('z');
for n=0:len-1
    Y=Y+y(n+1)*z^(-n);
end
disp('Display output-->');
disp(Y);

% without built in function old
x=[1 2 3 4 5];
X=0;
l=length(x);
z=sym('z');
for n=0:l-1
    X=X+x(n+1)*z^(-n);
end
disp('Display output');
disp(X);
```

Output:

Display input

1 2 3 4 5

Display output

2/z + 3/z^2 + 4/z^3 + 5/z^4 + 1

Display output

2/z + 3/z^2 + 4/z^3 + 5/z^4 + 1