Computer Assignment - 01 - Spring 2019

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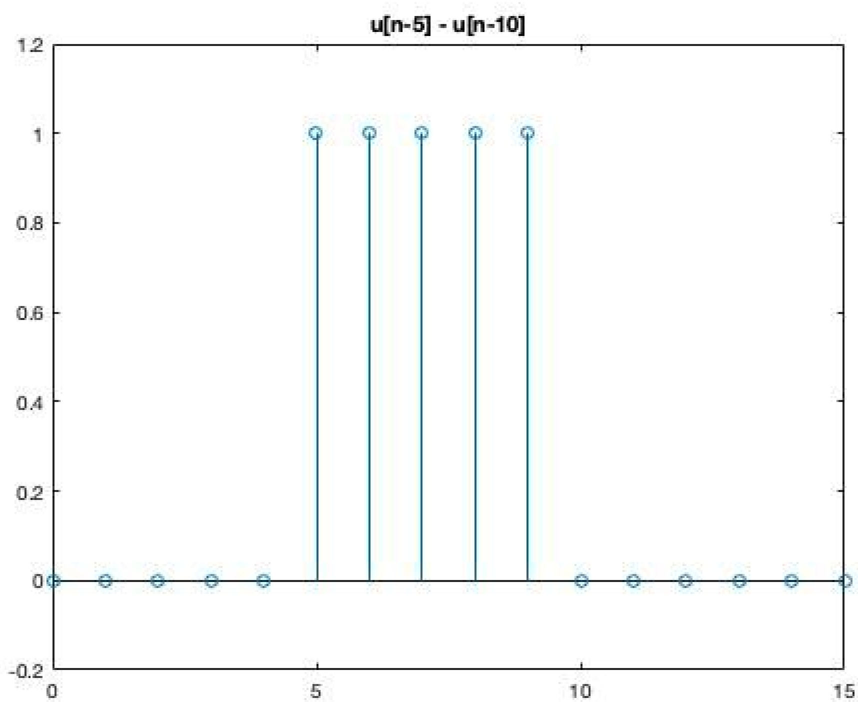
Signal Transformations

Task_1. Given u[n] the unit step sequence,using the stem function plot the following -

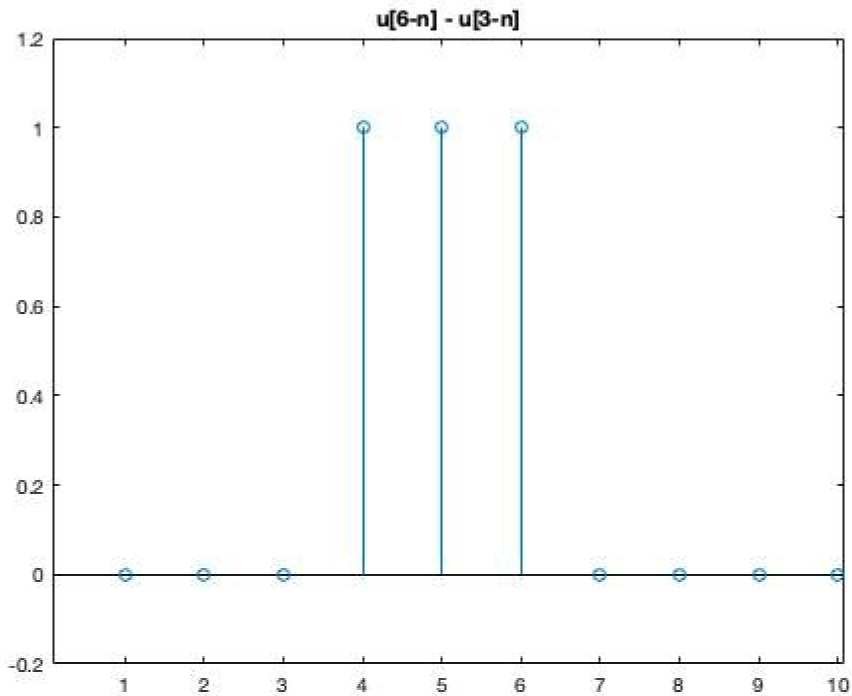
a. u[n-5] - u[n-10]
b. u[6-n] - u [3-n]
c. u[8-n]

Ans - % my unit step function

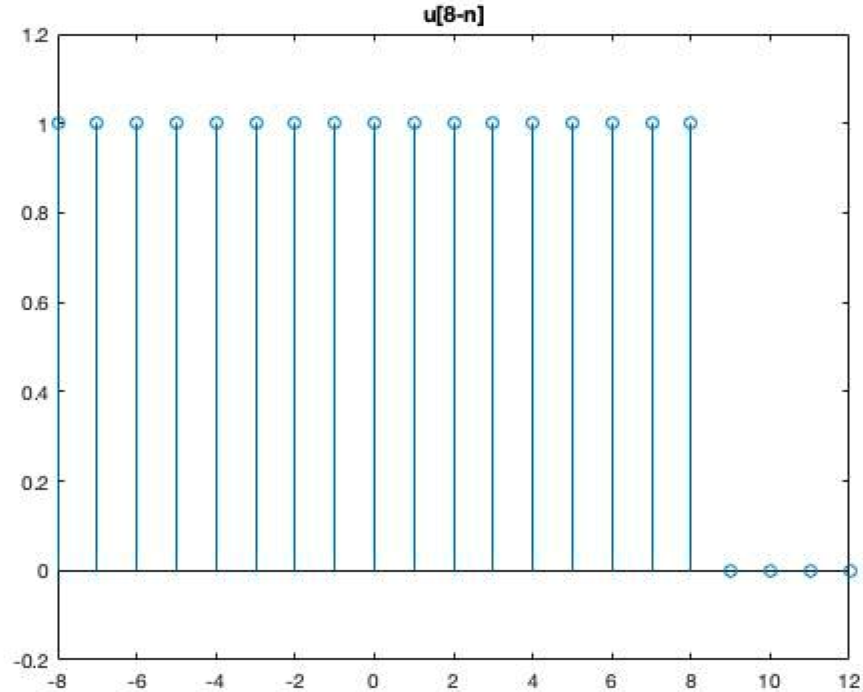
```
function y = unit_step(n)
    y = zeros(size(n));
    y(n>=0) = 1;
end

% a. u[n-5] -  u[n-10]
n = 0:1:15;
stem(n,unit_step(n-5)-unit_step(n-10),'o')
ylim([-0.2 1.2])
title('u[n-5] - u[n-10]')
```



```
% b. u[6-n] - u [3-n]
n = 0:1:10;
stem(n,unit_step(6-n)-unit_step(3-n),'o')
ylim([-0.2 1.2])
title('u[6-n] - u[3-n]')
```




```
% c. u[8-n]
stem(n,unit_step(8-n),'o')
ylim([-0.2 1.2])
title('u[8-n]')
```



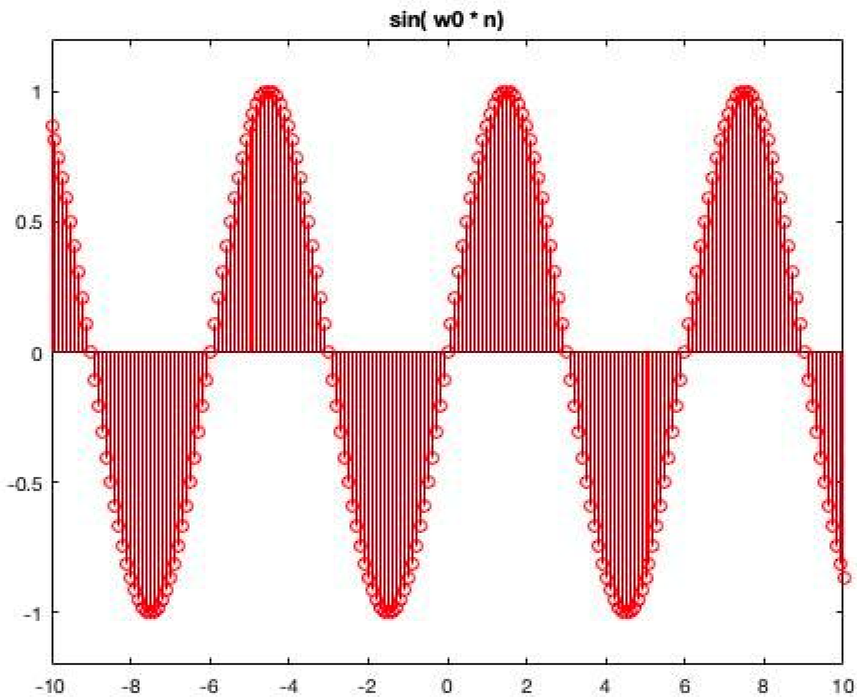
Task_2. Given the signal sin[ω_on], plot the following: Assume the unknown values

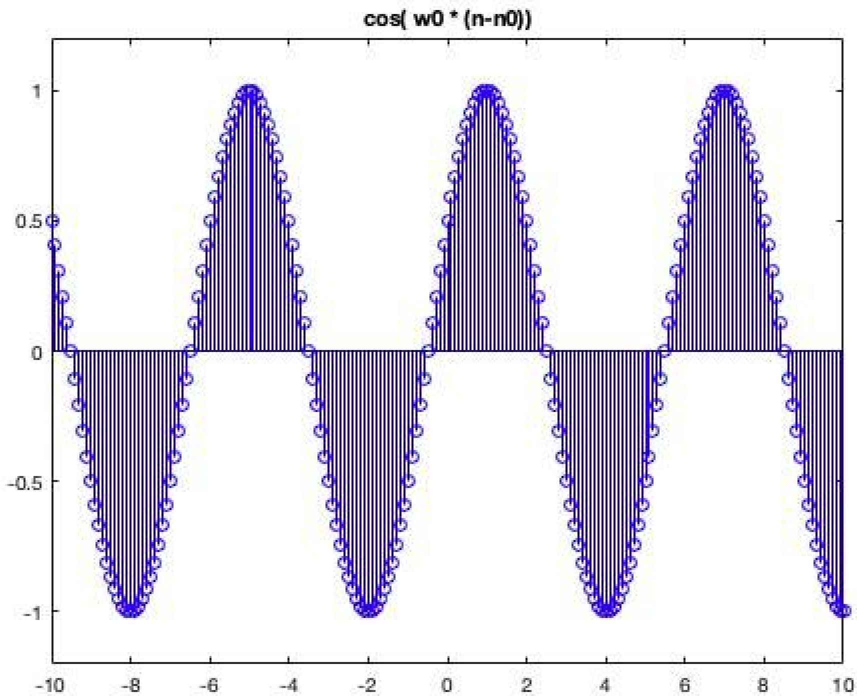
a. cos[ω_o(n-n_o)]
b. cos[ω_o(n+n_o)]

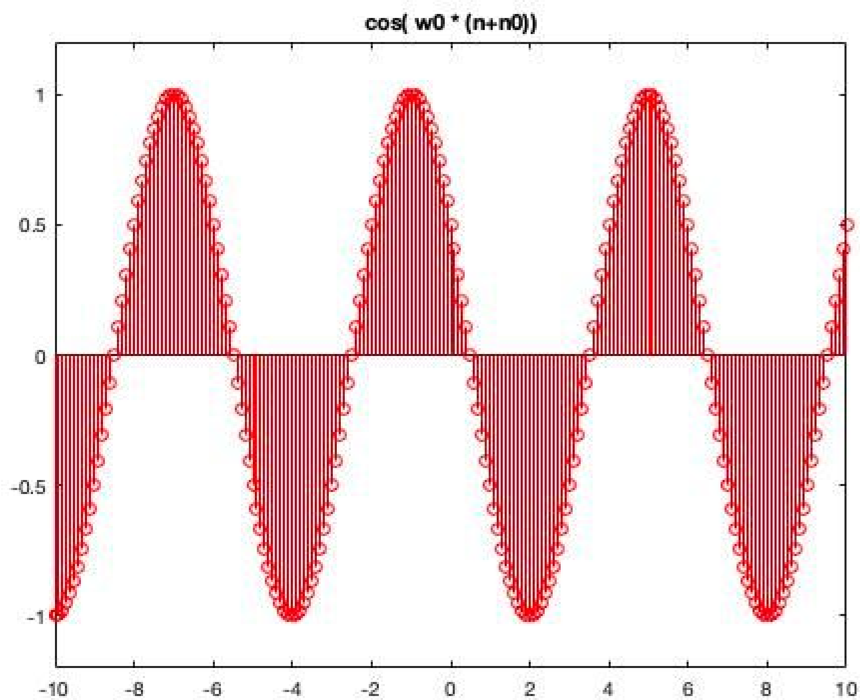
Ans -

```
w0 = pi/3;
n0 = 1;
n = -10:0.1:10;
y1 = zeros(size(n));
y1 = sin(w0*n);
y2 = zeros(size(n));
y2 = sin(w0*(n-n0)+pi/2);
y3 = zeros(size(n));
y3 = sin(w0*(n+n0)+pi/2);

stem(n,y1,'red')
ylim([-1.2 1.2])
title('sin( w0 * n)')

stem(n,y2,'blue')
ylim([-1.2 1.2])
```

```
title('cos( w0 * (n-n0))')

stem(n,y3,'red')
ylim([-1.2 1.2])
title('cos( w0 * (n+n0))')
```




cos(w0 * (n-n0))
1
0.5
0
-0.5
-1
-10
-8
-6
-4
-2
0
2
4
6
8
10


cos(w0 * (n+n0))
1
0.5
0
-0.5
-1
-10
-8
-6
-4
-2
0
2
4
6
8
10

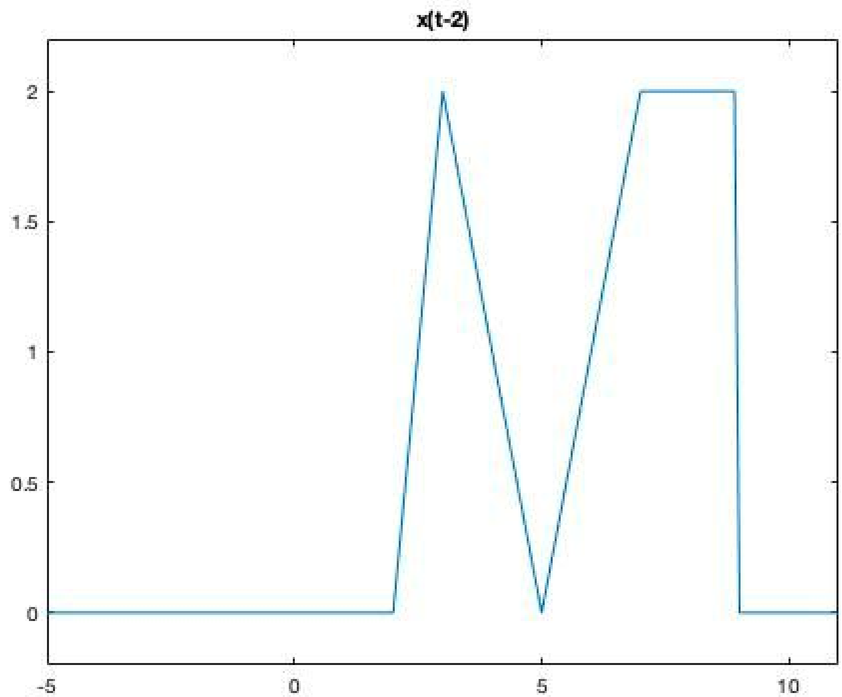
Task_3. Given the signal x(t) -

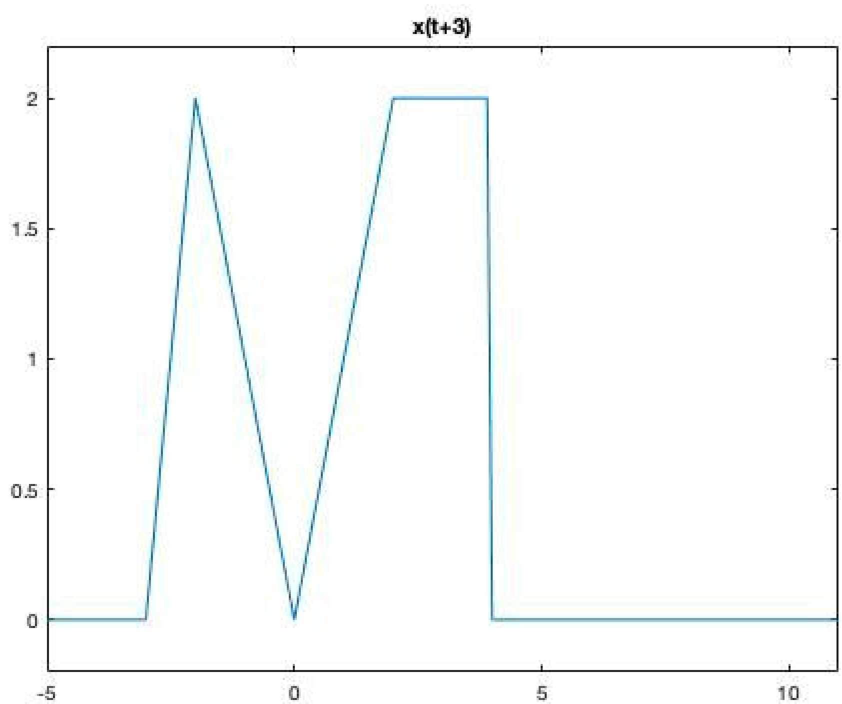
```
x(t) = 0 t<0
     = 2*t 0<=t<1
     = 3-t 1<=t<3
     = -3+t 3<=t<5
     = 2 5<=t<7
     = 0 t>=7
```

Ans - % my x(t) function

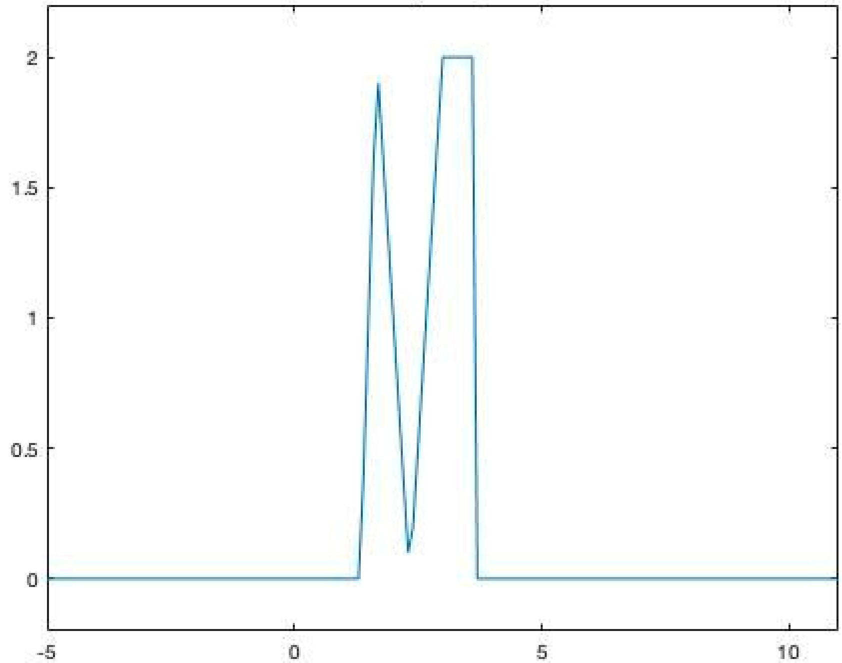
```
function y = x(t)
    y = zeros(size(t));
    y(t>=0 & t<1) = 2*t(t>=0 & t<1);
    y(t>=1 & t<3) = 3-t(t>=1 & t<3);
    y(t>=3 & t<5) = -3+t(t>=3 & t<5);
    y(t>=5 & t<7) = 2;
end

t = -5:0.1:11;
y1 = x(t-2);
y2 = x(t+3);
y3 = x(3*t-4);
y4 = x(1-3*t);

plot(t,y1)
title('x(t-2)')
ylim([-0.2 2.2])
xlim([-5 11])

plot(t,y2)
title('x(t+3)')
ylim([-0.2 2.2])
xlim([-5 11])

plot(t,y3)
title('x(3*t-4)')
ylim([-0.2 2.2])
```

```
xlim([-5 11])

plot(t,y4)
title('x(1-3*t)')
ylim([-0.2 2.2])
xlim([-5 11])
```

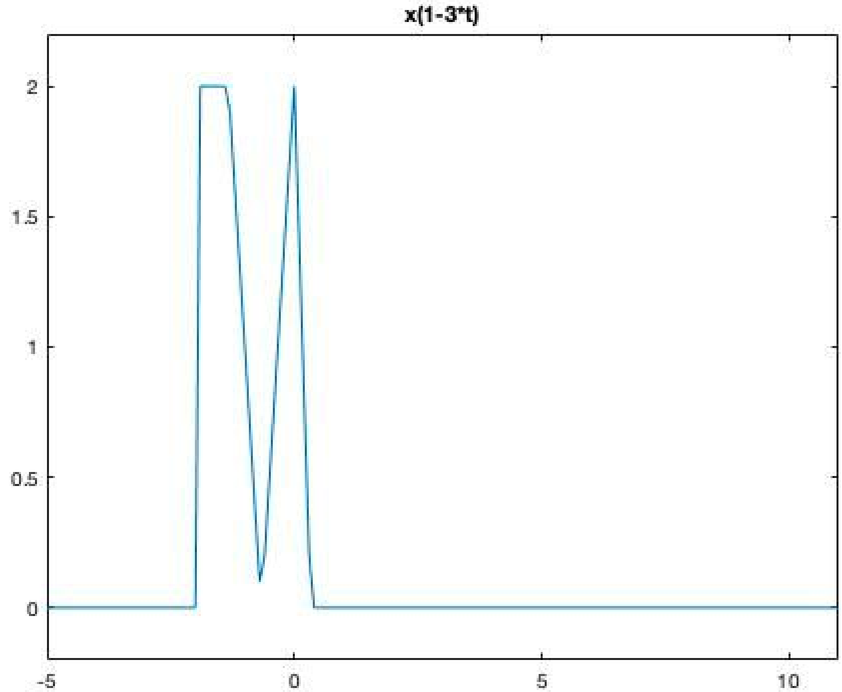




x(3*t-4)



x(1-3*t)



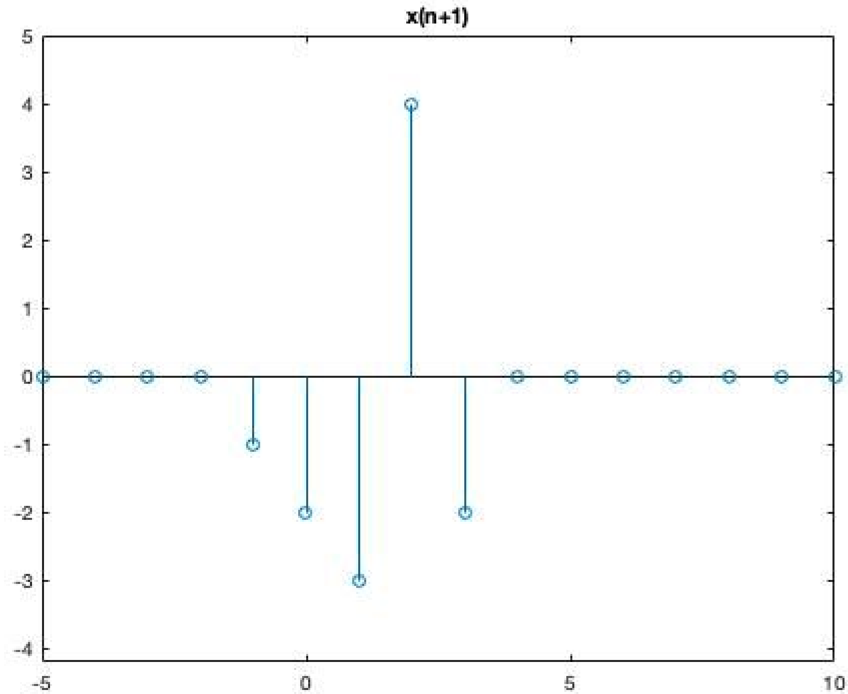
Task_4. Given the discrete signal, x[n] = [−1, −2, −3, 4, −2]

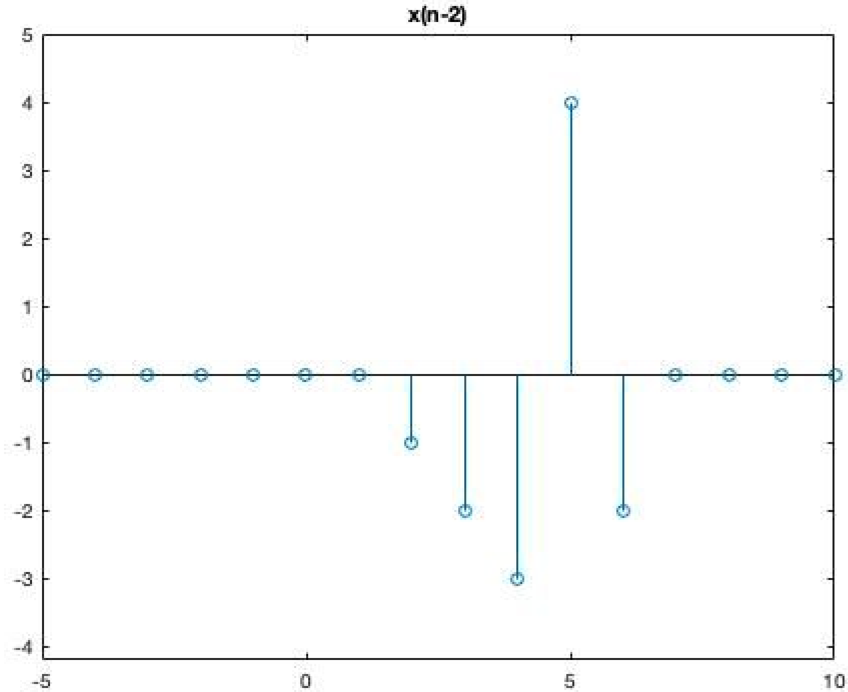
a. x[n+1]
b. x[n-2]
c. x[3-n]
d. x[3-2n]
e. x[4n+5]

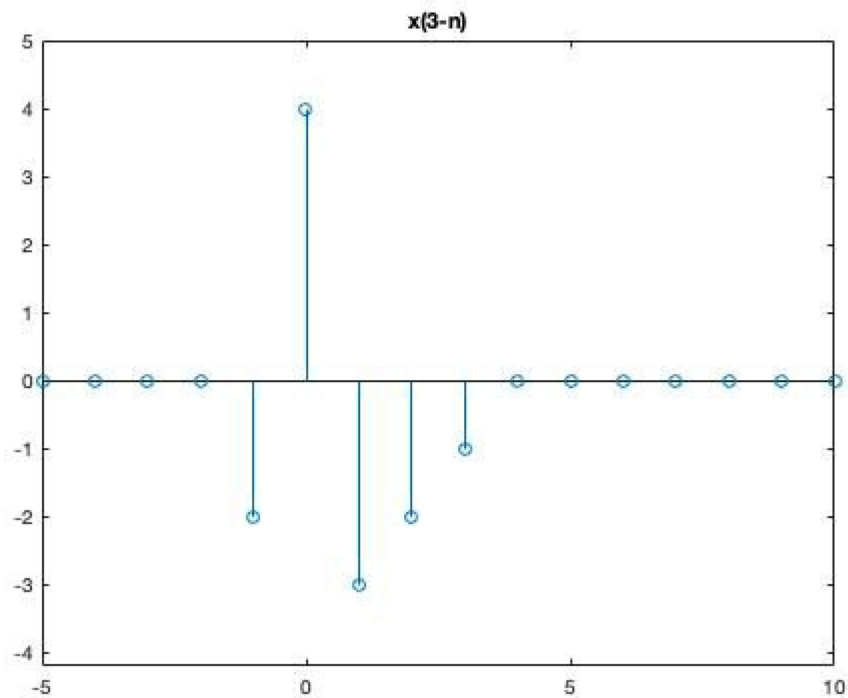
Ans - % my function x[n]

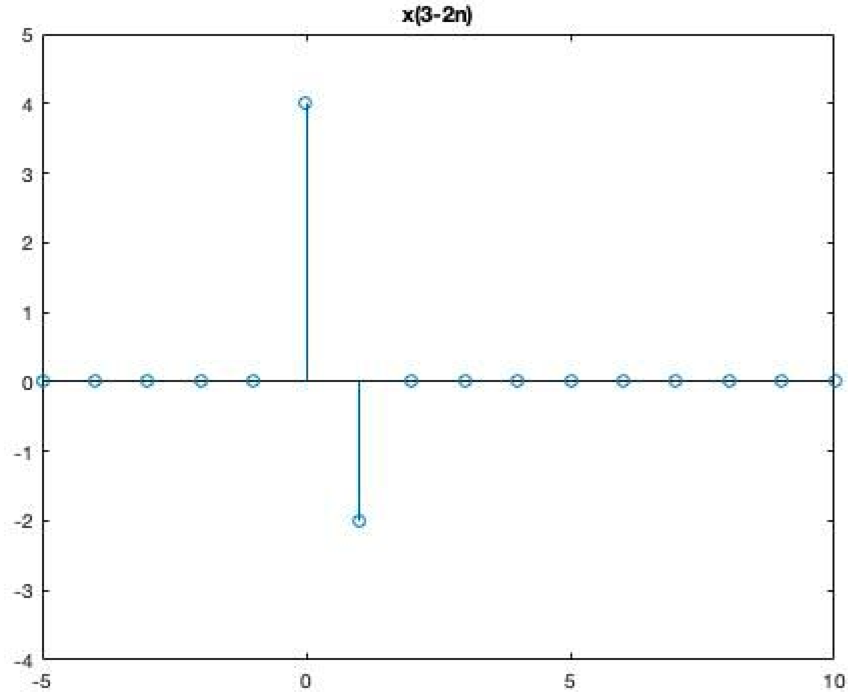
```
function y = x(n)
    y = zeros(size(n));
    y(n == 0) = -1;
    y(n == 1) = -2;
    y(n == 2) = -3;
    y(n == 3) = 4;
    y(n == 4) = -2;
end

n = -5:10;
y1 = x(n+1);
y2 = x(n-2);
y3 = x(3-n);
y4 = x(3-2*n);
y5 = x(4*n+5);

stem(n,y1);
ylim([-4.2 5])
title('x(n+1)')

stem(n,y2);
ylim([-4.2 5])
title('x(n-2)')

stem(n,y3);
ylim([-4.2 5])
title('x(3-n)')
```

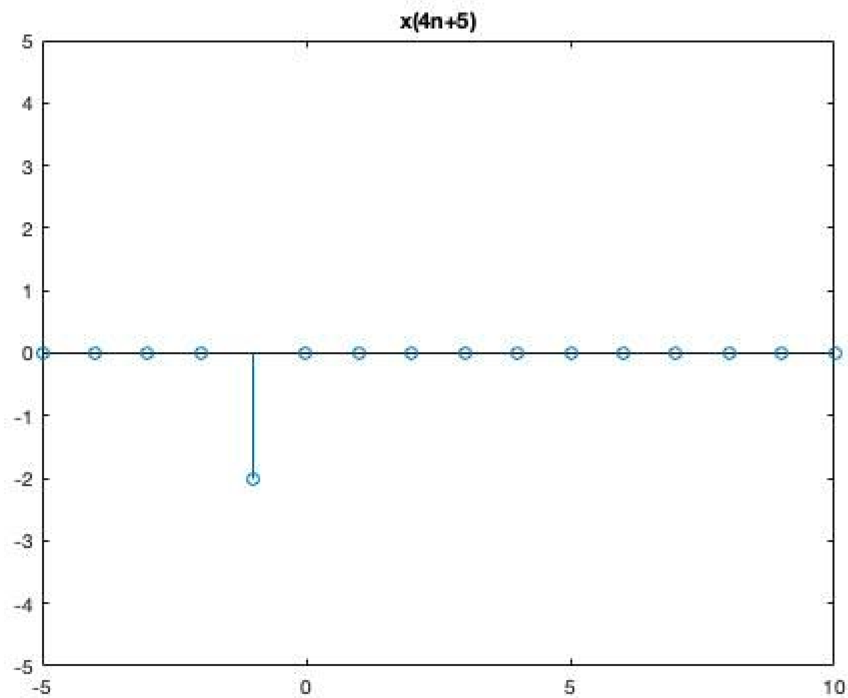
```
stem(n,y4);
ylim([-4 5])
title('x(3-2n)')

stem(n,y5);
ylim([-5 5])
title('x(4n+5)')
```




x(n-2)


x(3-n)


x(3-2n)
5
4
3
2
1
0
-1
-2
-3
-4
-5
0
5
10


x(4n+5)
5
4
3
2
1
0
-1
-2
-3
-4
-5
-5
0
5
10

Signal Generation

Task_1. Consider the signal

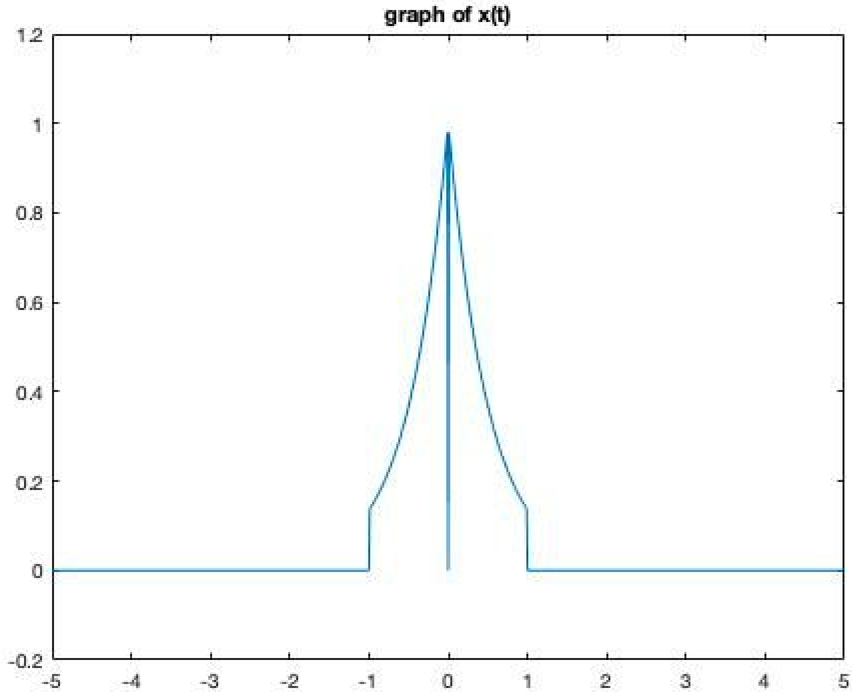
$$x(t) = \begin{cases} \exp(2t) & -1<t<0 \\ \exp(-2t) & 0<t<1 \\ 0 & \text{otherwise} \end{cases}$$

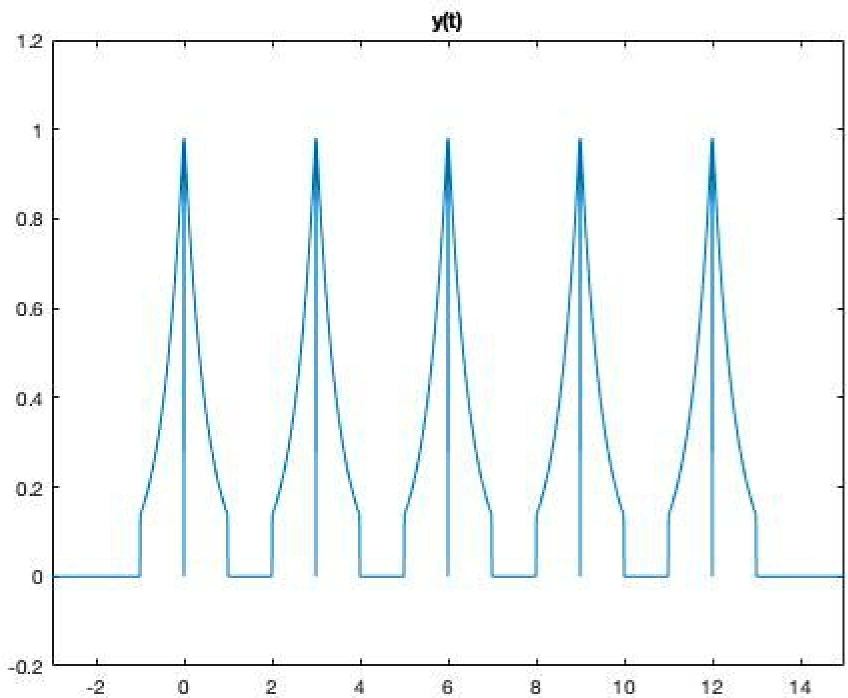
Answer/do the following

1. Plot x(t)
2. Define y(t) as a periodic signal equal to x(t) in the fundamental period T = 3. Plot y(t). Assume the number of pulses to be plotted as 5.

Ans - %my function x(t)

```
function y = x(t)
    y = zeros(size(t));
    y((t>-1) & (t<0)) = exp(2*t((t>-1) & (t<0)));
    y((t>0) & (t<1)) = exp(-2*t((t>0) & (t<1)));
end

t = -10:0.01:20;
T = 3;
graph = x(t);
plot(t,graph)
title('graph of x(t)')
xlim([-5 5])
ylim([-0.2 1.2])

y = zeros(size(t));
for n = 1:5
    a = n-1;
    y = y+x(t-(a*T));
end
plot(t,y)
title('y(t)')
xlim([-3 15])
ylim([-0.2 1.2])
```


graph of x(t)
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-5
-4
-3
-2
-1
0
1
2
3
4
5


y(t)
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-2
0
2
4
6
8
10
12
14

Thanks
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