Lab Report 1

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AIM - Generation and decomposition of signals into Even and Odd components.

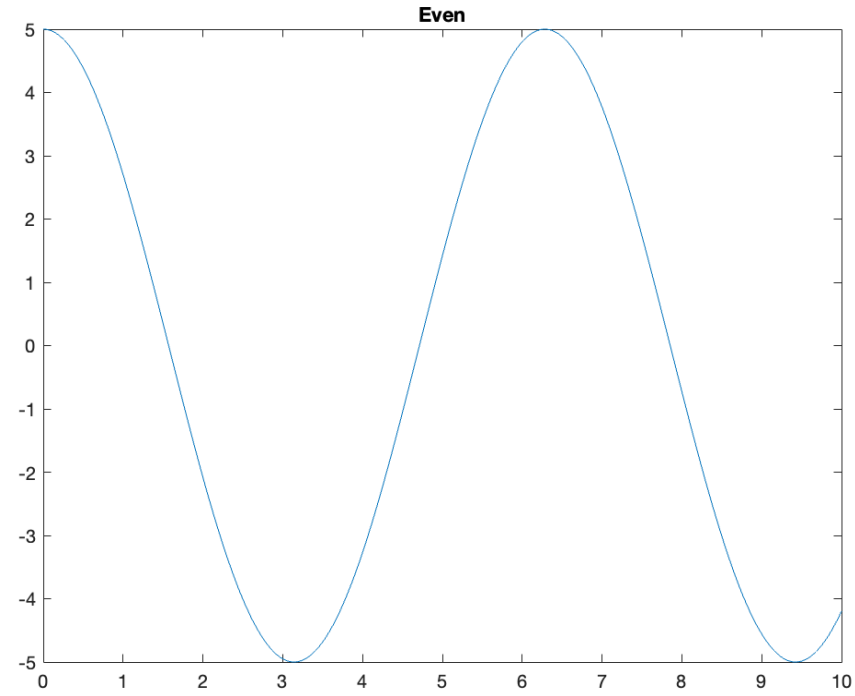
Software Used - MATLAB

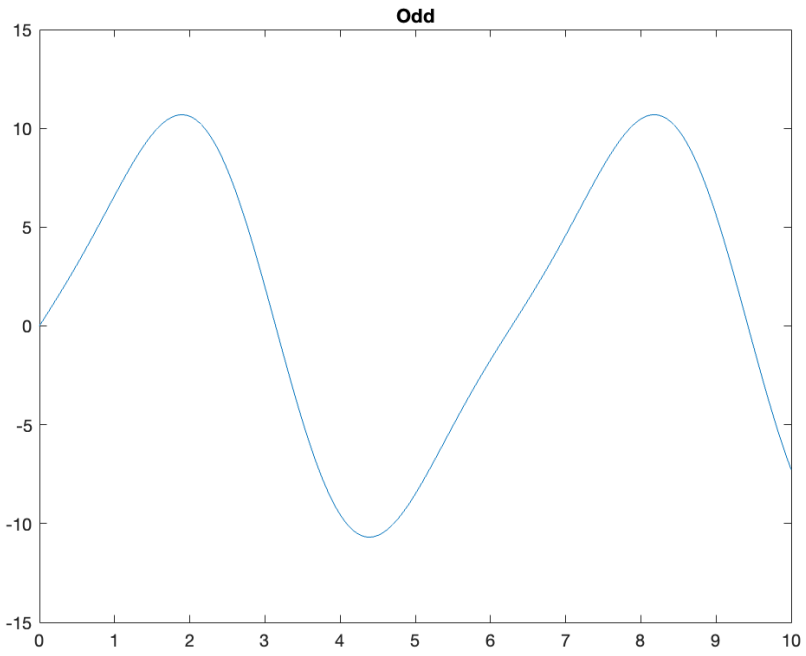
Questions –

Plot Even and Odd signals for the following :

1.x(t)=10sin(t) + 5cos(t) - 2cos(t)sin(t)

```
close all;

clear;

clc;

t = 0 : 0.001 : 10;

x = 10 * sin(t) + 5 * cos(t) - 2 * cos(t).* sin(t);

x1 = 10 * sin(-t) + 5 * cos(-t) -2 * cos(-t).*sin(-t);

xe = (x + x1)/2;

plot(t, xe);

title('Even');

xo = (x - x1)/2;

plot(t, xo);

title('Odd');
```

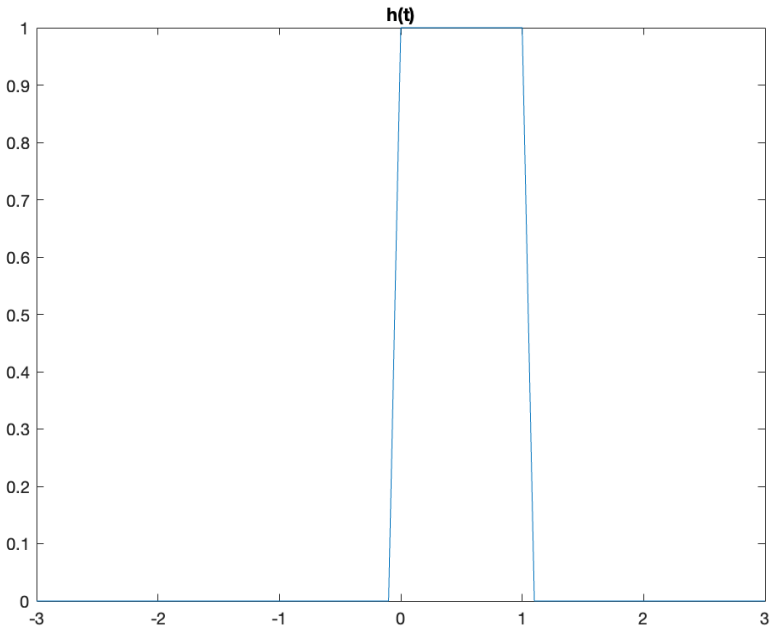

Even
5
4
3
2
1
0
-1
-2
-3
-4
-5
0
1
2
3
4
5
6
7
8
9
10

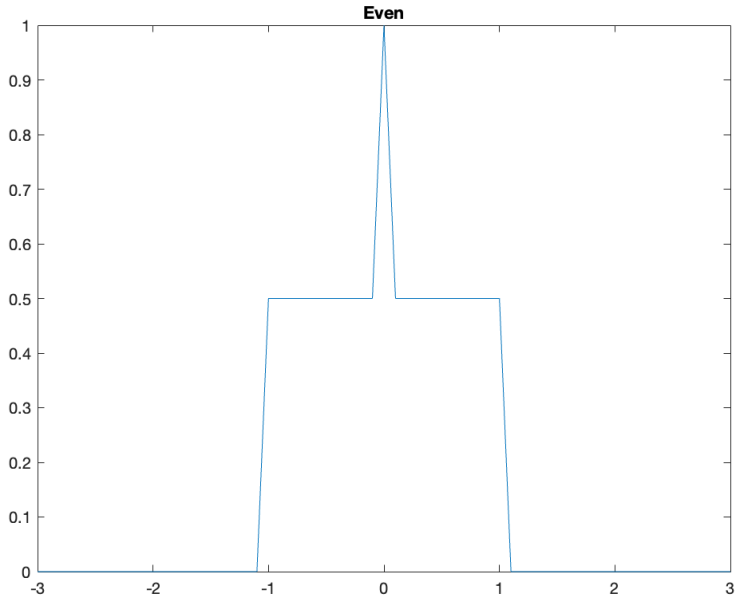

Odd
15
10
5
0
-5
-10
-15
0
1
2
3
4
5
6
7
8
9
10

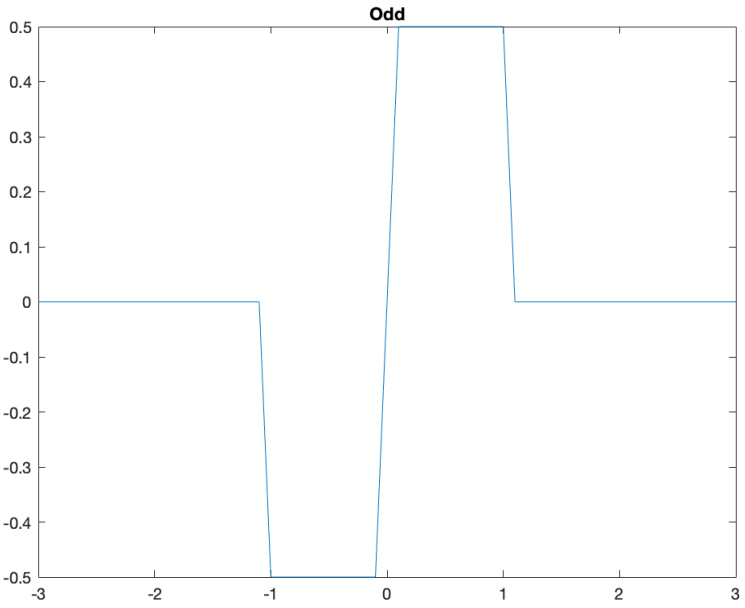
2. h(t) = {1 0<= t<= 1}
{0 otherwise}

```
close all;
clear;
clc;
y = [];
y1 = [];
c = 1;
for t = -3:0.1:3
   if(t >= 0 && t <= 1)
       y(c) = 1;
       c = c+1;
   else
       y(c) = 0;
       c = c+1;
   end
end
clear t;
clear c;
c = 1;
for t= -3:0.1:3
   if(t <= 0 && t >= -1)
       y1(c) = 1;
       c = c+1;
   else
       y1(c) = 0;
       c = c+1;
```

```
   end
end
clear t;
t = -3: 0.1: 3;
Even = (y + y1)/2;
Odd = (y - y1)/2;
plot(t, y);
title("h(t)");
plot(t, Even);
title("Even");
plot(t, Odd);
title("Odd");
```



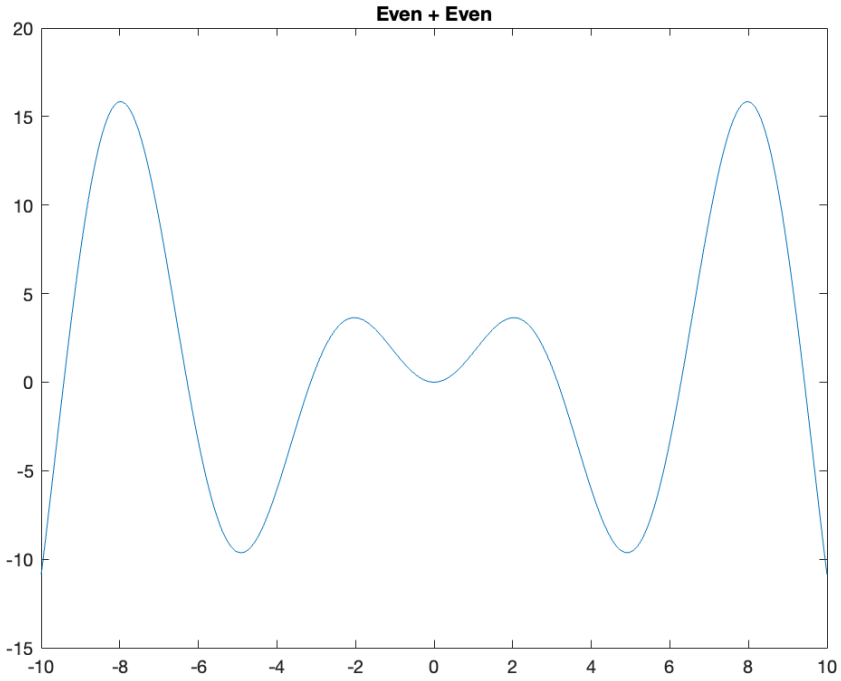


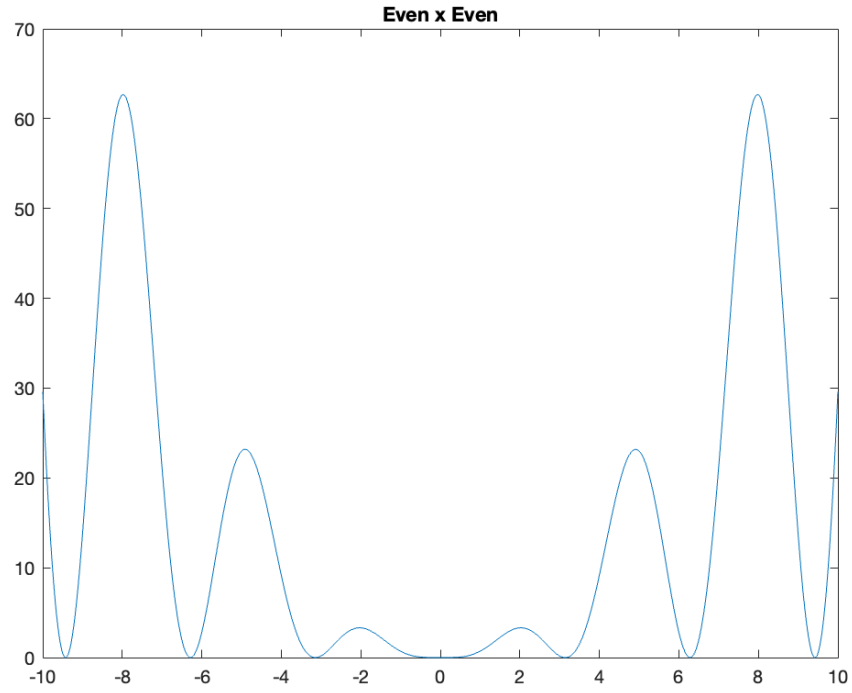


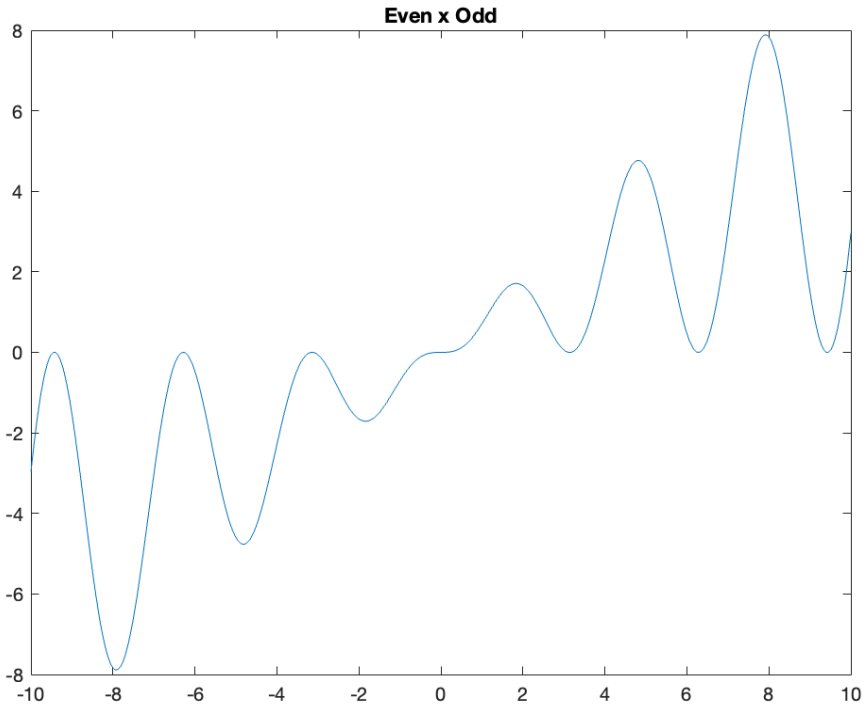
3. Using some signals out of $t^2\cos(t)$, $t^2\sin(t)$, $\cos(t)$, $\sin(t)$, t^2, $t\sin(t)$, $t\cos(t)$, demonstrate the properties of Even and Odd signals.

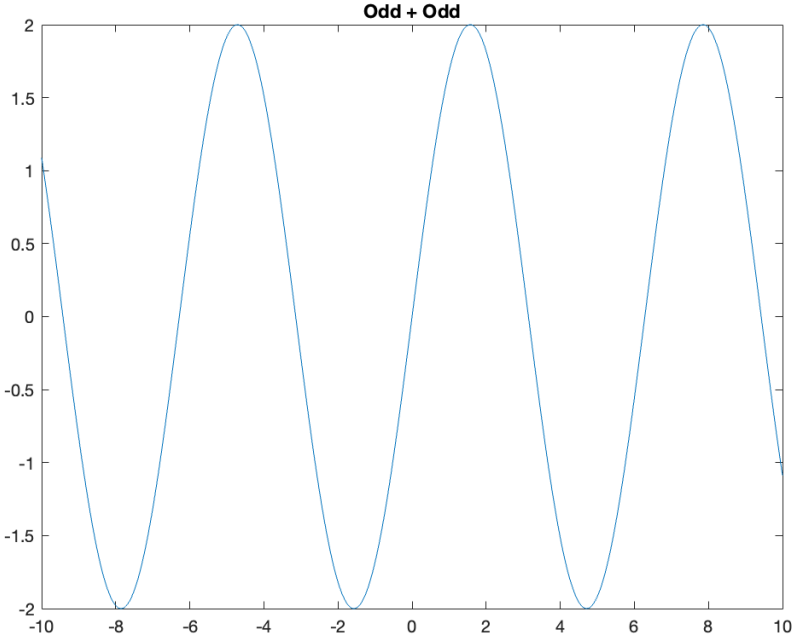
Even x Even = Even
Odd x Odd = Even
Even x Odd = Odd
Even +/- Even = Even
Odd +/- Odd = Odd

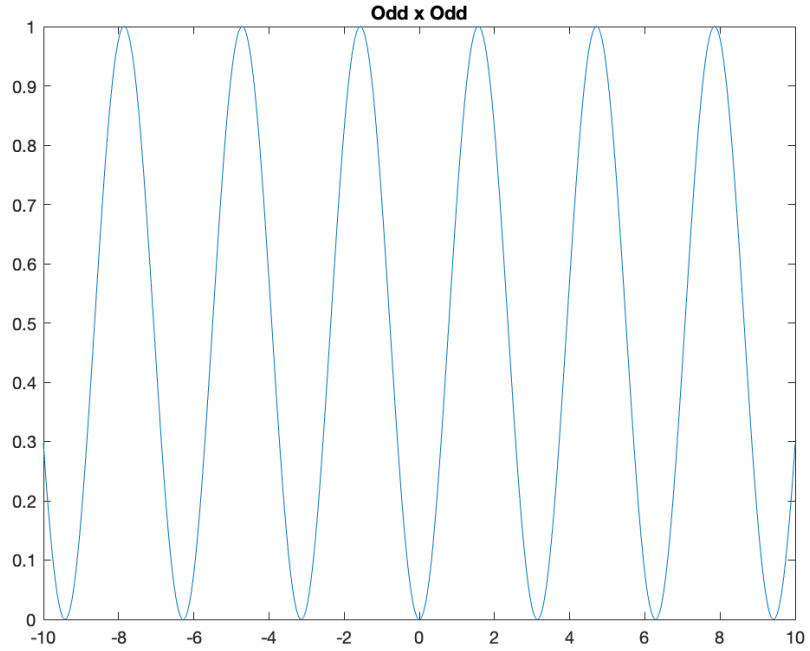
```
close all;
clear;
t = -10: 0.01: 10;
even = t.*sin(t);
odd = sin(t);
plot(t, even.*even);
title("Even x Even");
plot(t, odd.*odd);
title("Odd x Odd");
plot(t, even.*odd);
title("Even x Odd");
plot(t, even+even);
title("Even + Even");
plot(t, odd + odd);
title("Odd + Odd");
```


Even + Even
20
15
10
5
0
-5
-10
-15
-10
-8
-6
-4
-2
0
2
4
6
8
10


Even x Even
70
60
50
40
30
20
10
0
-10
-8
-6
-4
-2
0
2
4
6
8
10

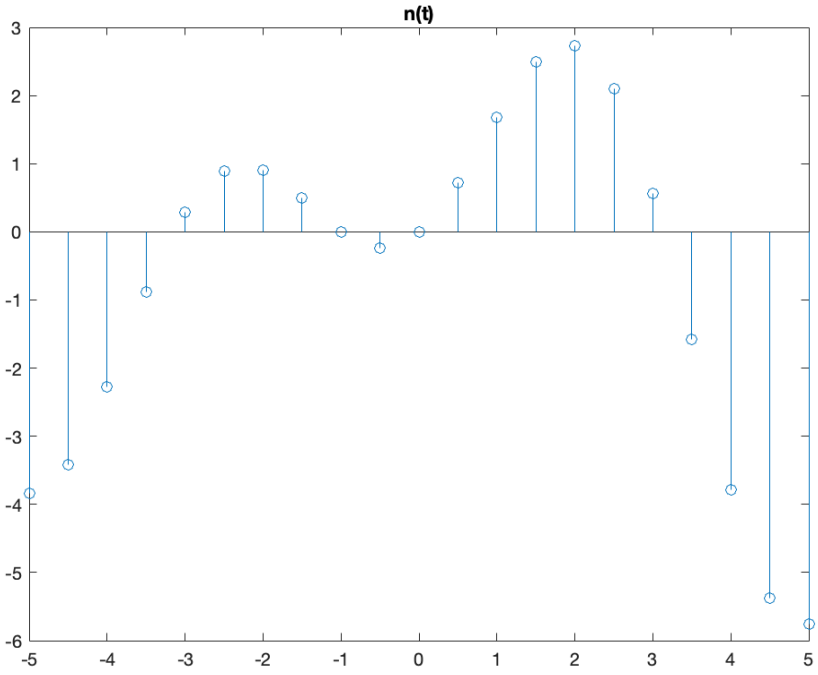

Even x Odd
8
6
4
2
0
-2
-4
-6
-8
-10
-8
-6
-4
-2
0
2
4
6
8
10

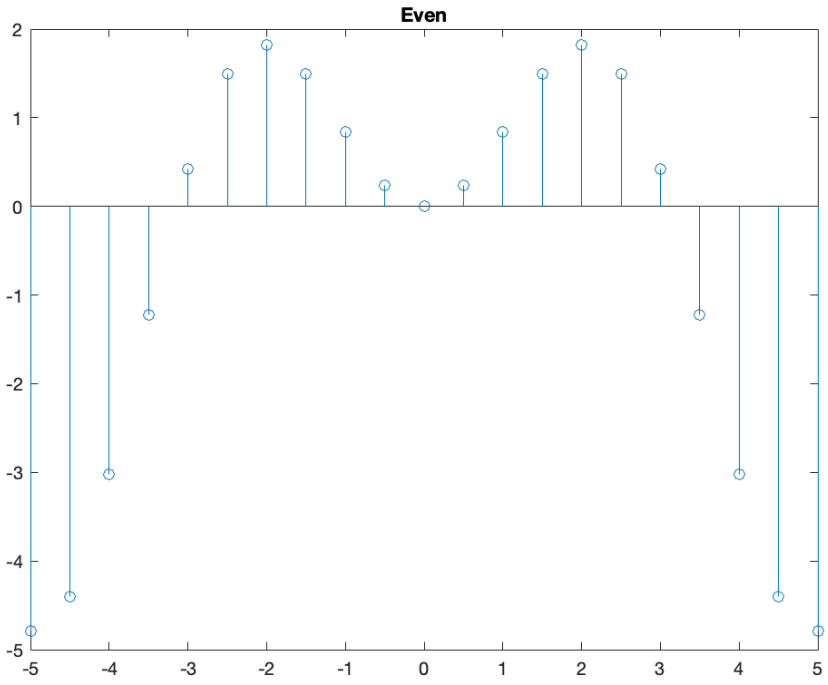

Odd + Odd
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-10
-8
-6
-4
-2
0
2
4
6
8
10

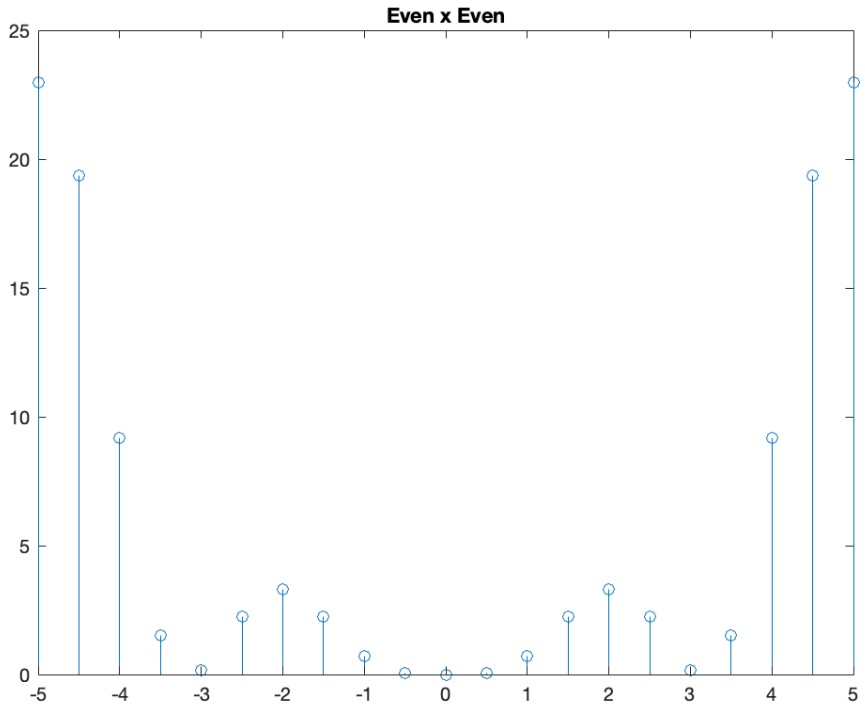

Odd x Odd
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-10
-8
-6
-4
-2
0
2
4
6
8
10

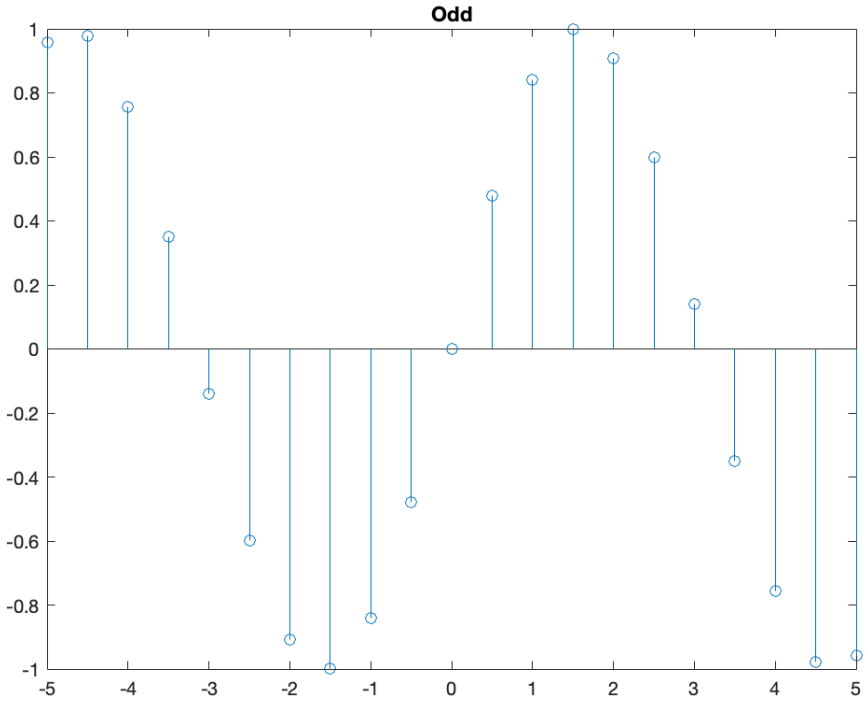
4. Plot discrete Even and Odd signals using stem() and demonstrate some of the points from the previous problem

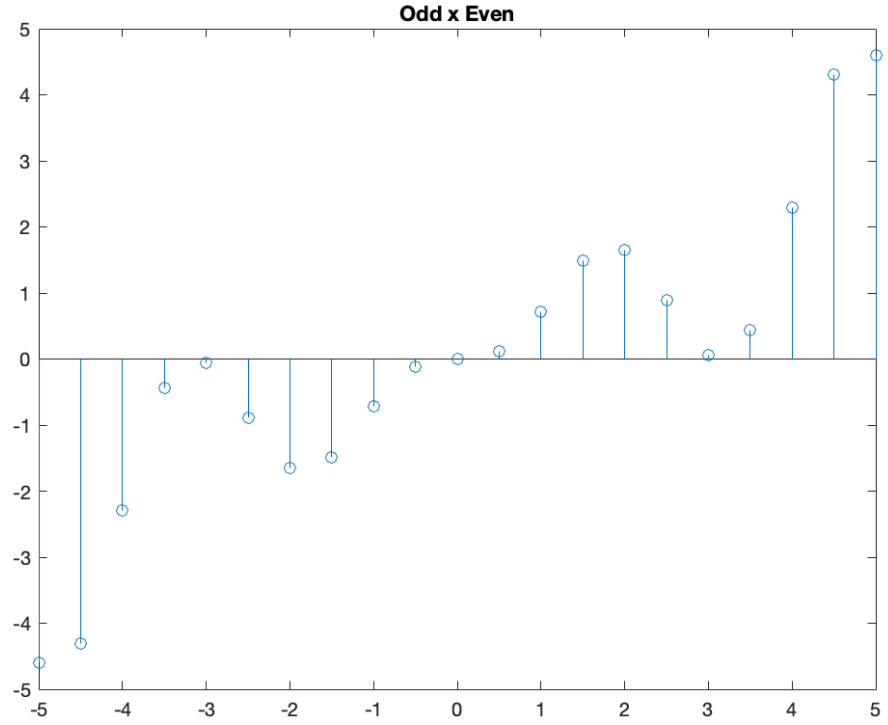
```
close all;

clear;

clc;

x = -5:0.5:5;

n = x.*sin(x) + sin(x);

n1 = -x.*sin(-x) + sin(-x);

stem(x,n);

title("n(t)");

e = (n + n1)/2;

o = (n - n1)/2;

stem(x,e);

title("Even");

stem(x, o);

title("Odd");

stem(x, e.*e);

title("Even x Even");

stem(x, o.*o);

title("Odd x Odd");

stem(x, o.*e);

title("Odd x Even");
```

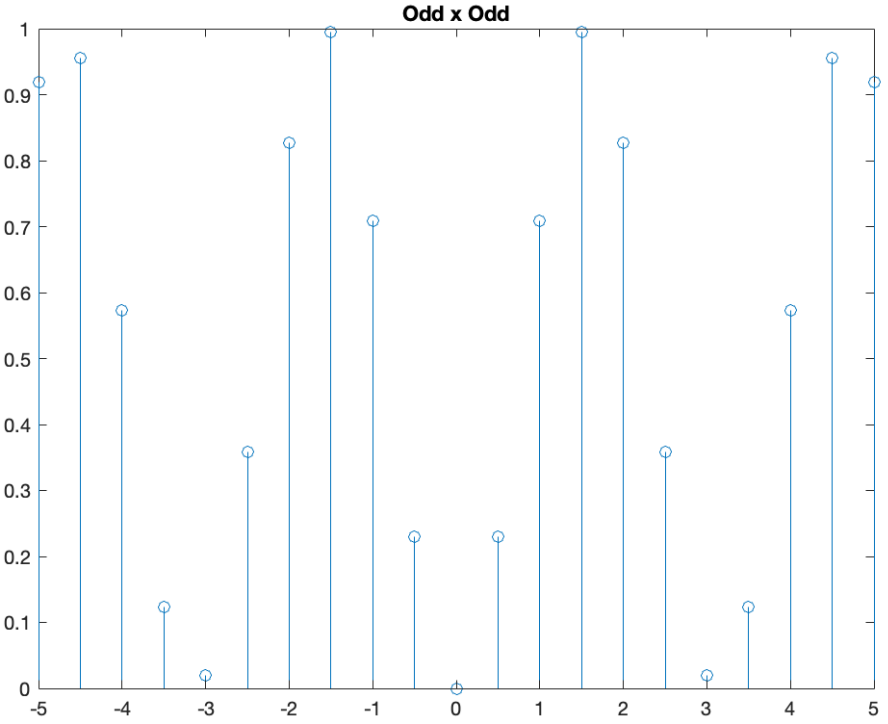

n(t)
3
2
1
0
-1
-2
-3
-4
-5
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5


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


Even x Even
25
20
15
10
5
0
-5
-4
-3
-2
-1
0
1
2
3
4
5


Odd
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-5
-4
-3
-2
-1
0
1
2
3
4
5


Odd x Even
5
4
3
2
1
0
-1
-2
-3
-4
-5
-5
-4
-3
-2
-1
0
1
2
3
4
5


Odd x Odd
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-5
-4
-3
-2
-1
0
1
2
3
4
5