

1 Signal Generation

1. For the given signals

$$x(t) = \begin{cases} 0 & t < 1 \\ t-1 & 1 \leq t < 2 \\ 2-\frac{t}{2} & 2 \leq t < 4 \\ -1 & 4 \leq t < 5 \\ 0 & \text{Otherwise} \end{cases} \quad y(t) = \begin{cases} 0 & t < 1 \\ 1 & 1 \leq t < 2 \\ -2 & 2 \leq t < 4 \\ t-4 & 4 \leq t < 5 \\ 0 & \text{Otherwise} \end{cases}$$

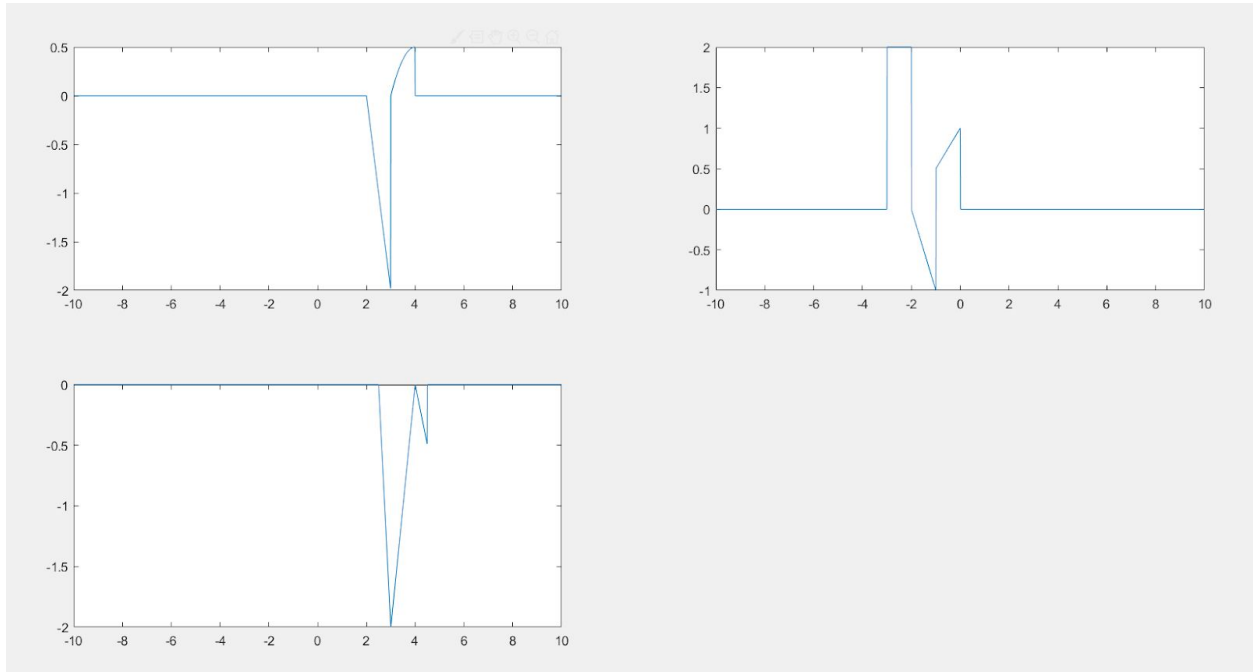
plot the following signal transformations: a) $x(t-1)$ $y(t+1)$, b) $x(2-t)y(1-t)$ and c) $x(2t-4)y(t)$

```
t=-10:0.01:10;
a1 = t-1;
a2 = t+1;
a3= 2-t;
a4= 1-t;
a5=2*t-4;
a6=t;
x1 = fx(a1);
y1 = fy(a2);
z1 = x1.*y1;
x2= fx(a3);
y2=fy(a4);
z2=x2.*y2;
x3=fx(a5);
y3=fy(a6);
z3=x3.*y3;
subplot(221);
plot(t,z1);
subplot(222);
plot(t,z2);
subplot(223);
plot(t,z3);
function x = fx(t)
x = zeros(size(t));
x(t<1)=0;
x(t>=1 & t<2)=t(t>=1 & t<2)-1;
x(t>=2 & t<4)=2-(t(t>=2 & t<4)/2);
x(t>=4 & t<5)=-1;
x(t>=5)=0;
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end
function y = fy(t)
y = zeros(size(t));
y(t<1)=0;
y(t>=1 & t<2)=1;
y(t>=2 & t<4)=-2;
y(t>=4 & t<5)=t(t>=4 & t<5)-4;
y(t>=5)=0;
end

```



2. For the given signals

$$x(t) = \begin{cases} 0 & t < 1 \\ 1-t & 1 \leq t < 2 \\ -3+t & 2 \leq t < 3 \\ 1 & 3 \leq t < 4 \\ 0 & \text{Otherwise} \end{cases} \quad y(t) = \begin{cases} 0 & t < 1 \\ 1 & 1 \leq t < 2 \\ -2 & 2 \leq t < 3 \\ t-5 & 3 \leq t < 4 \\ 0 & \text{Otherwise} \end{cases}$$

plot the following signal transformations: a) $x(t+1)$ $y(t-1)$, b) $x(2+t)y(-1-t)$ and c) $x(-2t-4)y(-t)$

```

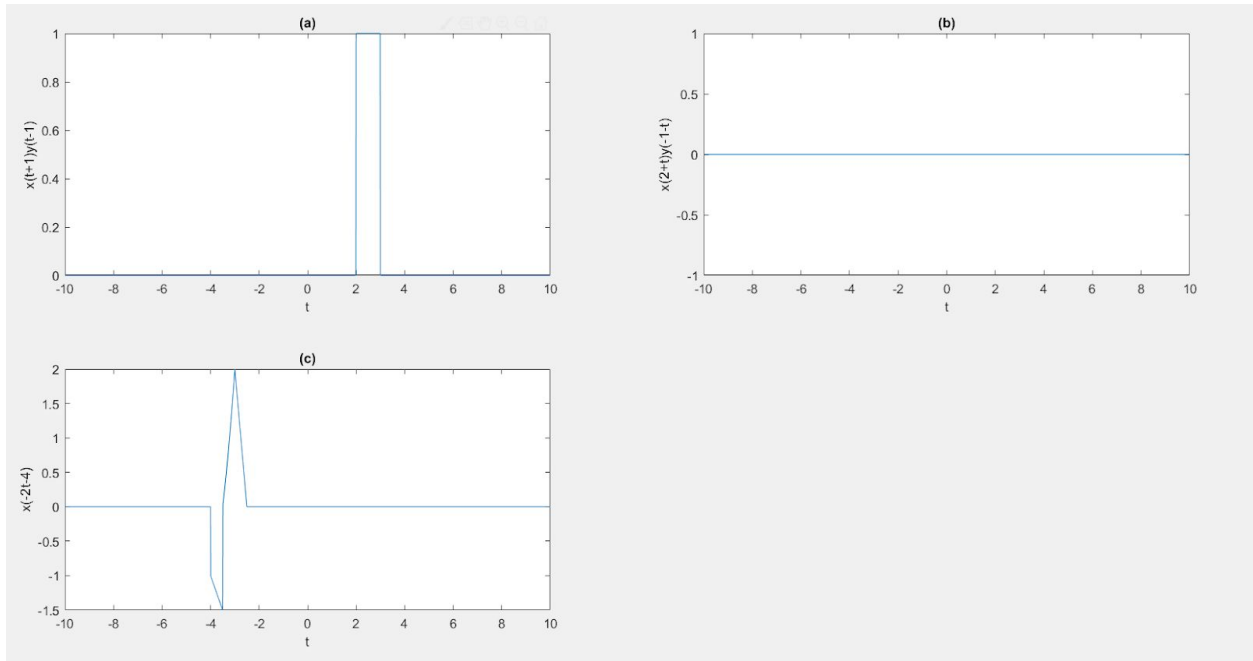
t=-10:0.01:10;
a1 = t+1;
a2 = t-1;
a3= 2+t;
a4= -1-t;
a5=-2*t-4;

```

```

a6=-t;
x1 = fx(a1);
y1 = fy(a2);
z1 = x1.*y1;
x2= fx(a3);
y2=fy(a4);
z2=x2.*y2;
x3=fx(a5);
y3=fy(a6);
z3=x3.*y3;
subplot(221);
plot(t,z1);
xlabel('t');
ylabel('x(t+1)y(t-1)')
title("(a)");
subplot(222);
plot(t,z2);
xlabel('t');
ylabel('x(2+t)y(-1-t)');
title("(b)");
subplot(223);
plot(t,z3);
xlabel('t');
ylabel('x(-2t-4)')
title("(c)");
function x = fx(t)
x = zeros(size(t));
x(t<1)=0;
x(t>=1 & t<2)=1-t(t>=1 & t<2);
x(t>=2 & t<3)=t(t>=2 & t<3)-3;
x(t>=3 & t<4)=1;
x(t>=4)=0;
end
function y = fy(t)
y = zeros(size(t));
y(t<1)=0;
y(t>=1 & t<2)=1;
y(t>=2 & t<3)=-2;
y(t>=3 & t<4)=t(t>=3 & t<4)-5;
y(t>=5)=0;
end

```



3. Given the Discrete Signal

$$x[n] = \{2, -2, 3, 4, -4\}$$

Plot the following transformation

(a) $x[n+1]$

(b) $x[n-2]$

(c) $x[3-n]$

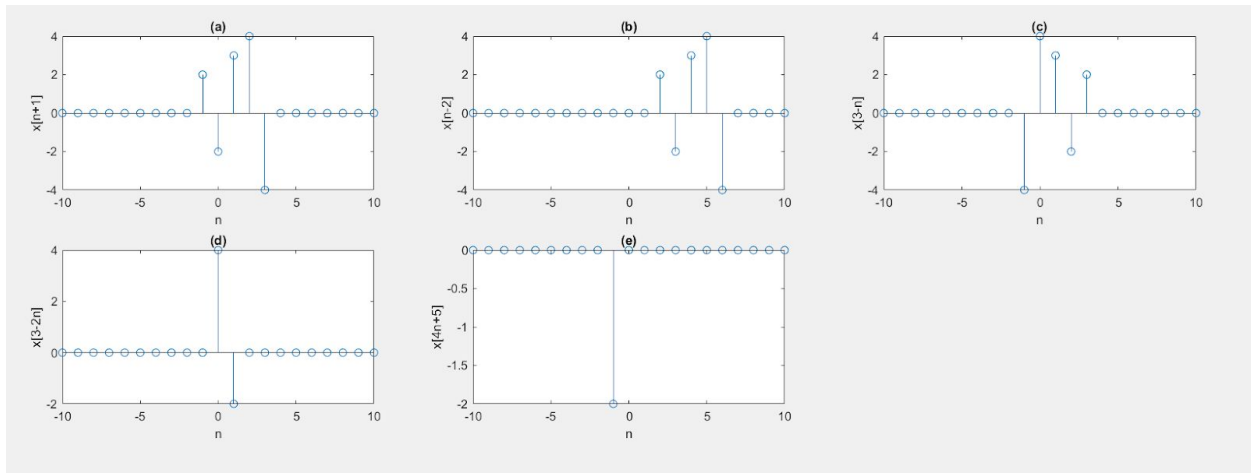
(d) $x[3-2n]$

(e) $x[4n+5]$

```
n=-10:10;
a=n+1;
b=n-2;
c=3-n;
d=3-2*n;
e=4*n+5
x1=fx(a);
x2=fx(b);
x3=fx(c);
x4=fx(d);
x5=fx(e);
subplot(331);
stem(n,x1);
xlabel('n');
ylabel('x[n+1]')
```

```
title("(a)");
subplot(332);
stem(n,x2);
xlabel('n');
ylabel('x[n-2]')
title("(b)");
subplot(333);
stem(n,x3);
xlabel('n');
ylabel('x[3-n]')
title("(c)");
subplot(334);
stem(n,x4);
xlabel('n');
ylabel('x[3-2n]')
title("(d)");
subplot(335);
stem(n,x5);
xlabel('n');
ylabel('x[4n+5]')
title("(e)");
```

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



4.. Given the Discrete Signal

$x[n] = \{-1, 2, -3, -4, 5\}$

Plot the following transformation

(a) $x[n-1]$

(b) $x[n+2]$

(c) $x[-3-n]$

(d) $x[-3+2n]$

(e) $x[4n-5]$

$n = -10:1:10;$

$a = n-1;$

$b = n+2;$

$c = -3-n;$

$d = -3+2*n;$

$e = 4*n-5$

$x1 = fx(a);$

$x2 = fx(b);$

$x3 = fx(c);$

$x4 = fx(d);$

$x5 = fx(e);$

$\text{subplot}(231);$

$\text{stem}(n, x1);$

$\text{xlabel}('n');$

$\text{ylabel}('x[n-1]')$

$\text{title}('(a)');$

$\text{subplot}(232);$

$\text{stem}(n, x2);$

$\text{xlabel}('n');$

$\text{ylabel}('x[n+2]')$

```

title("b");
subplot(233);
stem(n,x3);
xlabel('n');
ylabel('x[-3-n]')
title("c");
subplot(234);
stem(n,x4);
xlabel('n');
ylabel('x[-3+2n]')
title("d");
subplot(235);
stem(n,x5);
xlabel('n');
ylabel('x[4n-5]')
title("e");

```

```

function x=fx(n)
x=zeros(size(n));
x(n==0)=-1;
x(n==1)=2;
x(n==2)=-3;
x(n==3)=-4;
x(n==4)=5;
end

```

