

LAB REPORT-7

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Submitted by-

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$$Q1 \quad x[n] = \begin{cases} a^n & n \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

given $a=1$

$$X(e^{j\omega}) = \sum_{n=-\infty}^{\infty} x[n] e^{-j\omega n} = \sum_{n=0}^{\infty} 1 \cdot e^{-j\omega n}$$

$$X(e^{j\omega}) = \left(\frac{1}{1 - e^{-j\omega}} \right)$$

$$Q2 \quad x[n] = \begin{cases} 1 & |n| \leq 2 \\ 0 & \text{otherwise} \end{cases}$$
$$= \begin{cases} 1 & -2 \leq n \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

$$X(e^{j\omega}) = \sum_{n=-\infty}^{\infty} x[n] e^{-j\omega n}$$

$$= \sum_{n=-2}^2 1 \cdot e^{-j\omega n} = e^{2j\omega} + e^{j\omega} + 1 + e^{-j\omega} + e^{-2j\omega}$$

$$Q3 \quad x[n] = u[n] - u[n-N], \quad N=10$$

$$= u[n] - u[n-10]$$

$$= \begin{cases} 0 & n < 0 \\ 1 & 0 \leq n < 10 \\ 0 & n \geq 10 \end{cases}$$

$$n < 0$$

$$0 \leq n < 10$$

$$n \geq 10$$

$$X(e^{j\omega}) = \sum_{n=-\infty}^{\infty} x[n] e^{-j\omega n} = \sum_{n=0}^9 x[n] e^{-j\omega n}$$

$$= \sum_{n=0}^9 e^{-j\omega n} = \frac{1 \cdot [1 - (e^{-j\omega})^{10}]}{(1 - e^{-j\omega})}$$

$$Q4 \quad x(t) = \begin{cases} 2 & 0 \leq t < 1 \\ -1 & 1 \leq t < 2 \\ 0 & \text{otherwise} \end{cases}$$

$$u(t) = \begin{cases} 1 & t \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

$$y(t) = x(t) * u(t)$$

$$Y(j\omega) = X(j\omega) U(j\omega)$$

$$X(j\omega) = \int_{-\infty}^{\infty} x(t) e^{-j\omega t} dt = \int_0^1 e^{-j\omega t} dt + \int_1^2 -e^{-j\omega t} dt$$

$$= 2 \frac{e^{-j\omega t}}{-j\omega} \Big|_0^1 - \frac{e^{-j\omega t}}{-j\omega} \Big|_1^2$$

$$= \left(\frac{2e^{-j\omega}}{-j\omega} - \frac{2}{-j\omega} \right) - \left(\frac{e^{-2j\omega}}{-j\omega} - \frac{e^{-j\omega}}{-j\omega} \right)$$

$$= \frac{-3e^{-j\omega}}{j\omega} + \frac{e^{-2j\omega}}{j\omega} + \frac{2}{j\omega}$$

$$U(j\omega) = \int_{-\infty}^{\infty} u(t) e^{-j\omega t} dt = \int_{-\infty}^{\infty} \frac{1}{2} (1 + \text{sign}(t)) e^{-j\omega t} dt$$

$$= \frac{1}{2} \int_{-\infty}^{\infty} e^{-j\omega t} dt + \frac{1}{2} \int_{-\infty}^{\infty} \text{sign}(t) e^{-j\omega t} dt$$

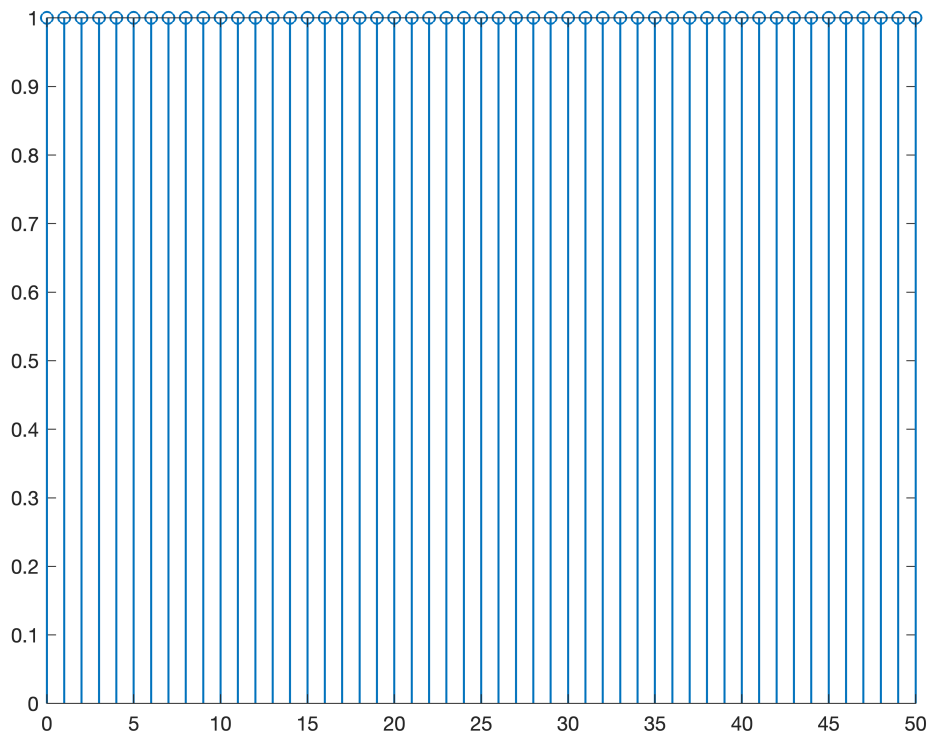
$$= \frac{1}{2} \left[2\pi \delta(\omega) + \frac{2}{j\omega} \right]$$

$$= \pi \delta(\omega) + \frac{1}{j\omega}$$

$$\Rightarrow Y(j\omega) = \left(2 + \frac{e^{-2j\omega} - 3e^{-j\omega}}{j\omega} \right) \left(\pi \delta(\omega) + \frac{1}{j\omega} \right)$$

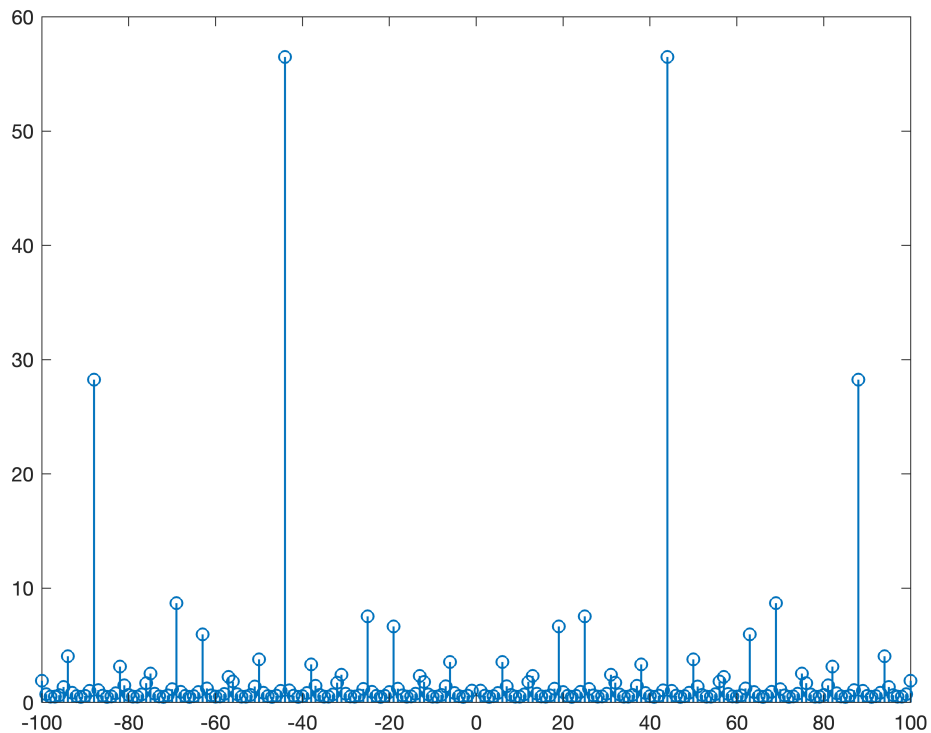
Q1

```
x = [];  
count = 1;  
warning("off");  
a = 1;  
for q = 0:50  
    if q >= 0 && q <= 50  
        x(count) = a ^ q;  
        count = count+1;  
    else  
        x(count) = 0;  
        count = count+1;  
    end  
end  
n = 0:50;  
stem(n ,x, 'LineWidth', 1);
```

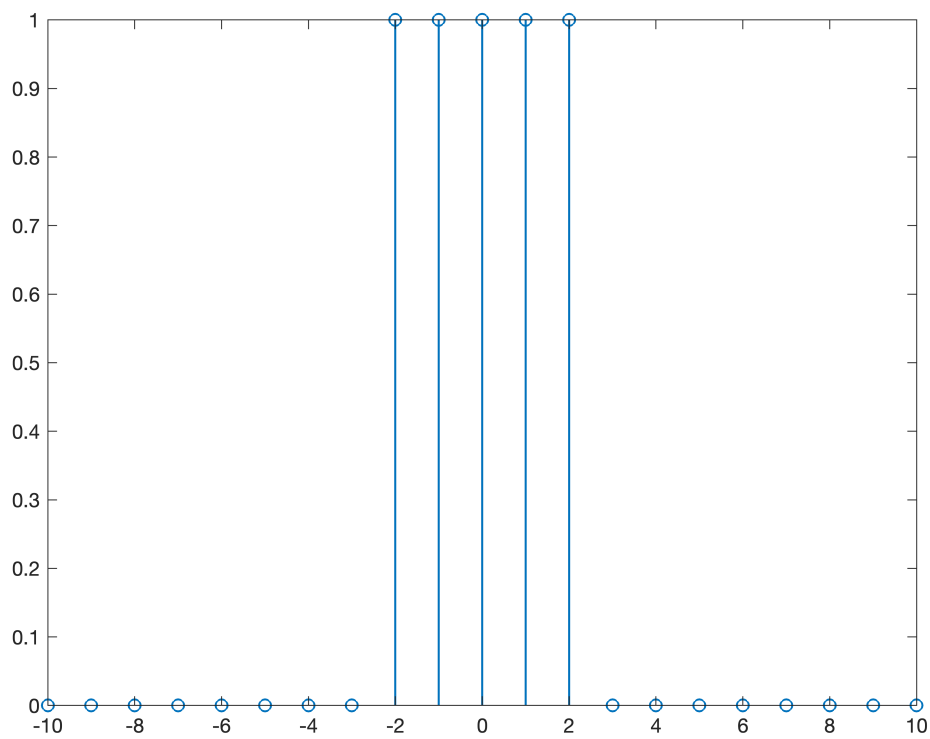


```
xjw = [];  
w = -100:100;  
q = -100:100;  
xjw = abs(1./(1-exp(-1j*q)));
```

```
stem(w ,xjw, 'LineWidth', 1);
```



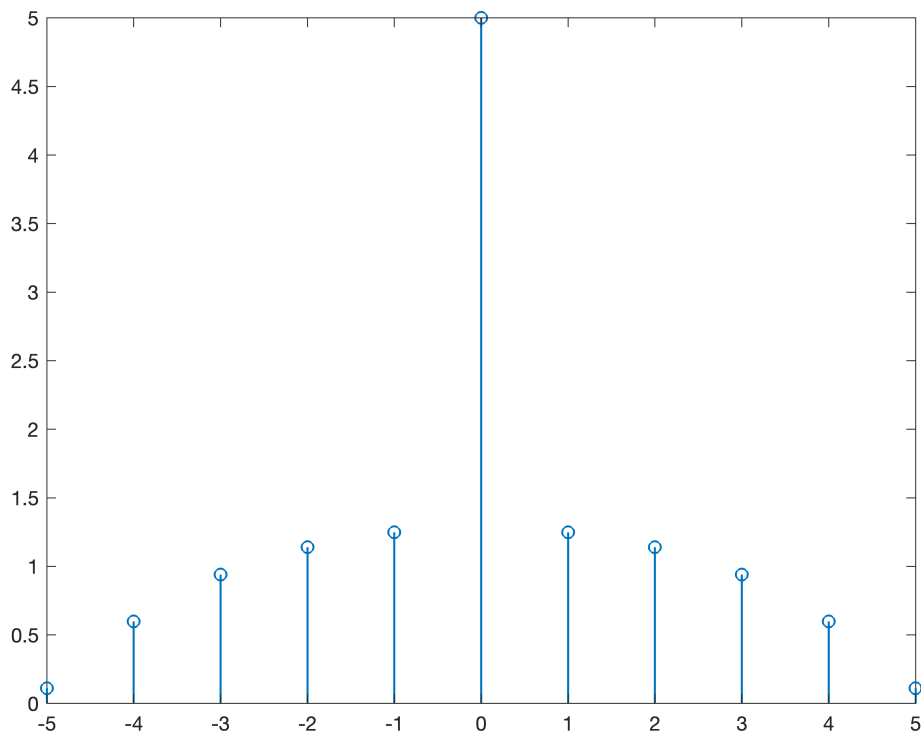
```
clear x;
clear count;
clear xjw;
x = [];
count = 1;
a = 2;
for q = -10:10
    if q >= -2 && q <= 2
        x(count) = 1;
        count = count+1;
    else
        x(count) = 0;
        count = count+1;
    end
end
n = -10:10;
stem(n ,x, 'LineWidth', 1);
```



```

xjw = [];
w = -5:5;
k = 1;
for q=-5:5
    xjw(k) = abs(1+exp(2*1j*q)+exp(1j*q)+exp(-2*1j*q)+exp(-1j*q));
    k = k+1;
end
stem(w ,xjw, 'LineWidth', 1);

```



Q2

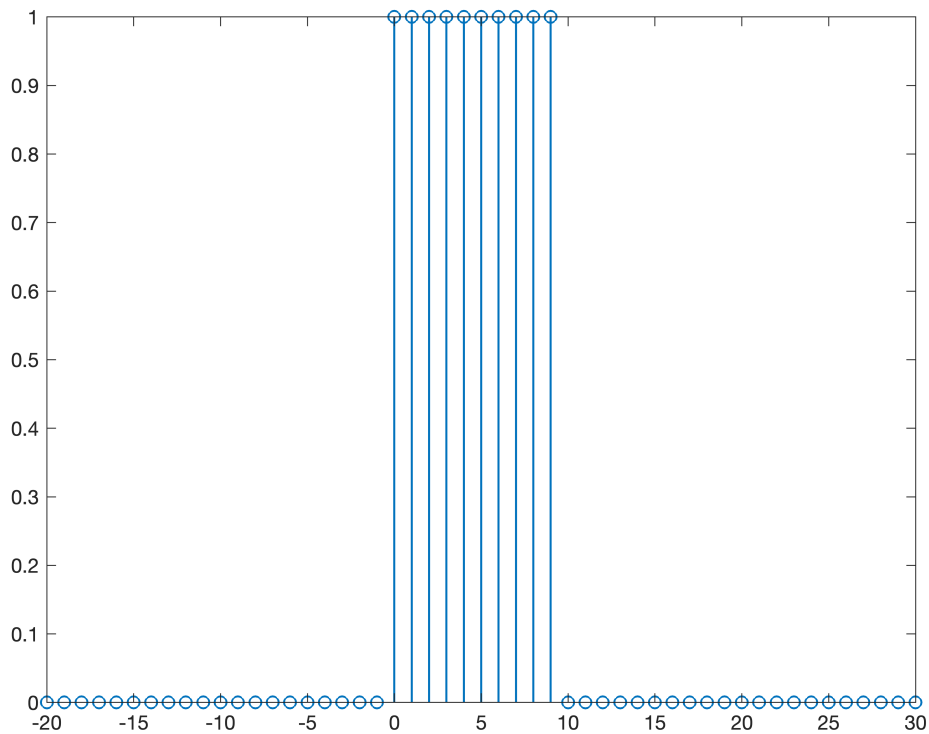
```
clear x;
clear count;
clear xjw;
x=[];
count=1;
a=2;
for q=-20:30
    if q < 0
        x(count)=0;
        count=count+1;
    else
        x(count)=1;
        count=count+1;
    end
end
y=[];
j=1;
for q=-20:30
    if q < 10
        y(j)=0;
        j=j+1;
    else
```



```

        y(j)=1;
        j=j+1;
    end
end
final=[];
k=1;
for q=-20:30
    final(k)=x(k)-y(k);
    k=k+1;
end
n=-20:30;
stem(n ,final, 'LineWidth', 1);

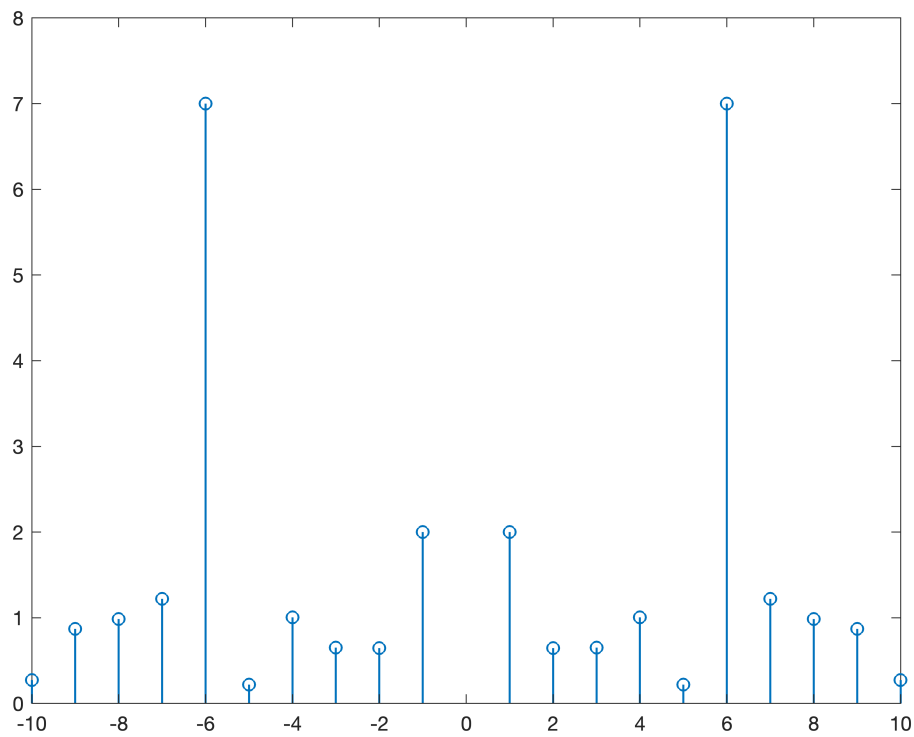
```



```

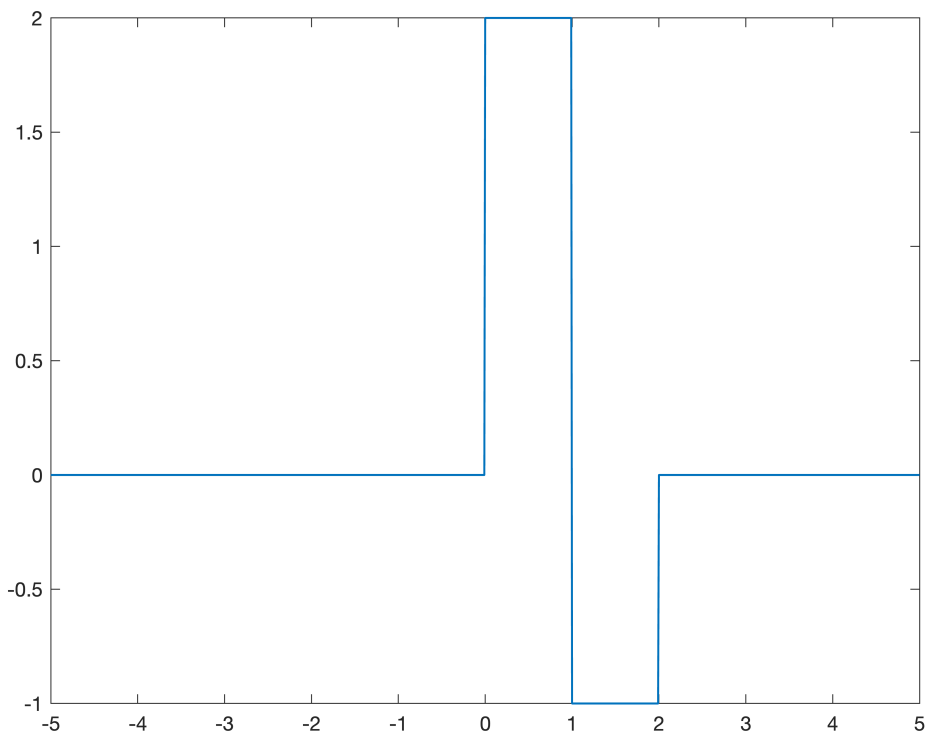
xjw=[];
w = -10:10;
count = 1;
for q = -10:10
    xjw(count) = abs((exp(-10*1j*q)-1)/(exp(-1j*q)-1));
    count = count+1;
end
stem(w ,xjw, 'LineWidth', 1);

```



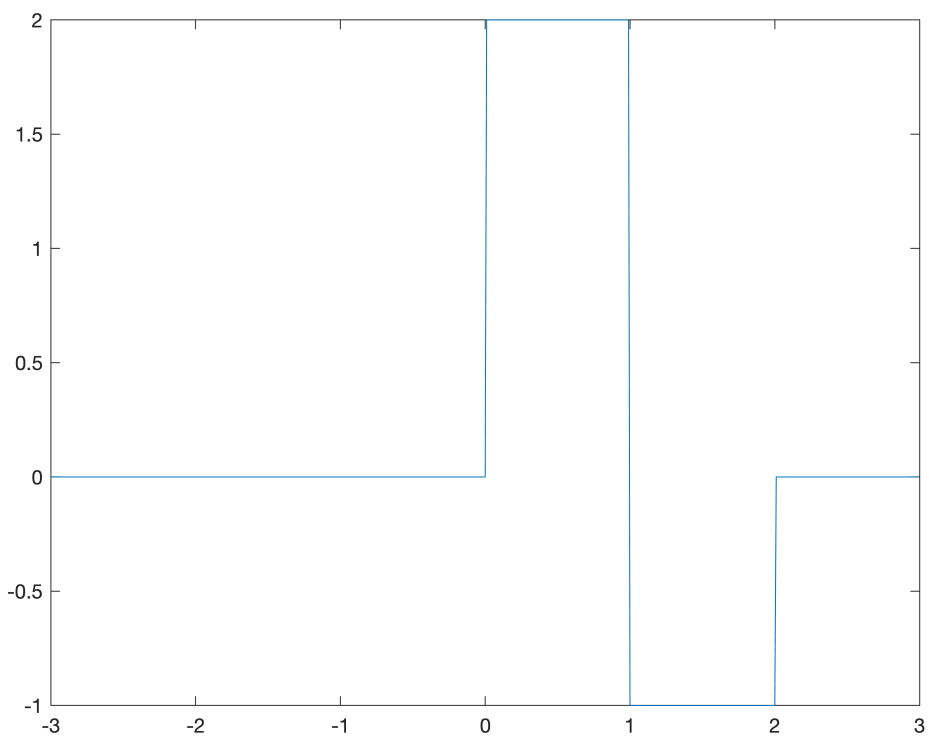
Q3

```
clear count;
clear x;
clear xjw;
count = 1;
x = [];
for t = -5:0.01:5
    if t>=0 && t<1
        x(count) = 2;
    elseif t>=1 && t<2
        x(count) = -1;
    else
        x(count) = 0;
    end
    count = count + 1;
end
t = -5:0.01:5;
plot(t, x, 'LineWidth', 1);
```

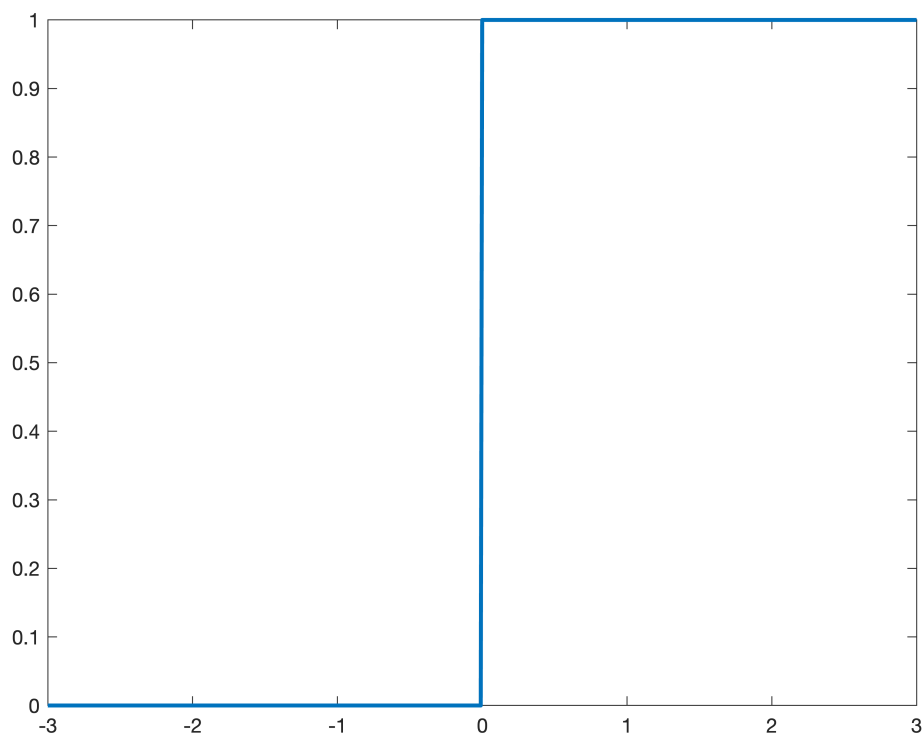


Q4

```
clear x;
clear count;
x=[];
count=1;
for t=-3:0.01:3
    if t>0 && t<1
        x(count)=2;
        count=count+1;
    elseif t>=1 && t<=2
        x(count)=-1;
        count=count+1;
    else
        x(count)=0;
        count=count+1;
    end
end
t=-3:0.01:3;
plot(t,x)
```



```
u=[];  
count=1;  
for t=-3:0.01:3  
    if t>=0  
        u(count)=1;  
        count=count+1;  
    else  
        u(count)=0;  
        count=count+1;  
    end  
end  
t=-3:0.01:3;  
plot(t,u, 'LineWidth', 2);
```



```
w = -5:0.01:5;
impul=zeros(size(w));
impul(w==0)=1;
U=(pi*impul+(1./(1i*(w))));
X=((2-3*exp(-1i*w)+exp(-2*1i.*w)).*(1./(1j*w)));
Y=X.*U;
plot (w, abs (Y), 'LineWidth', 1.5);
```