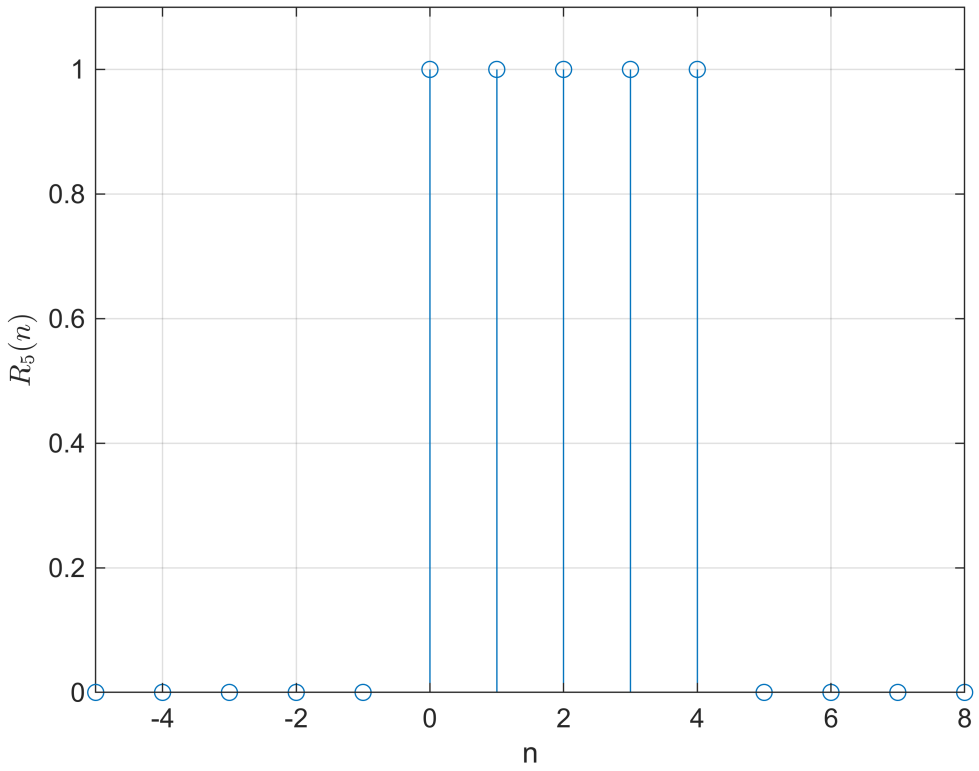
```
clc
clear
close all
```

DTFT

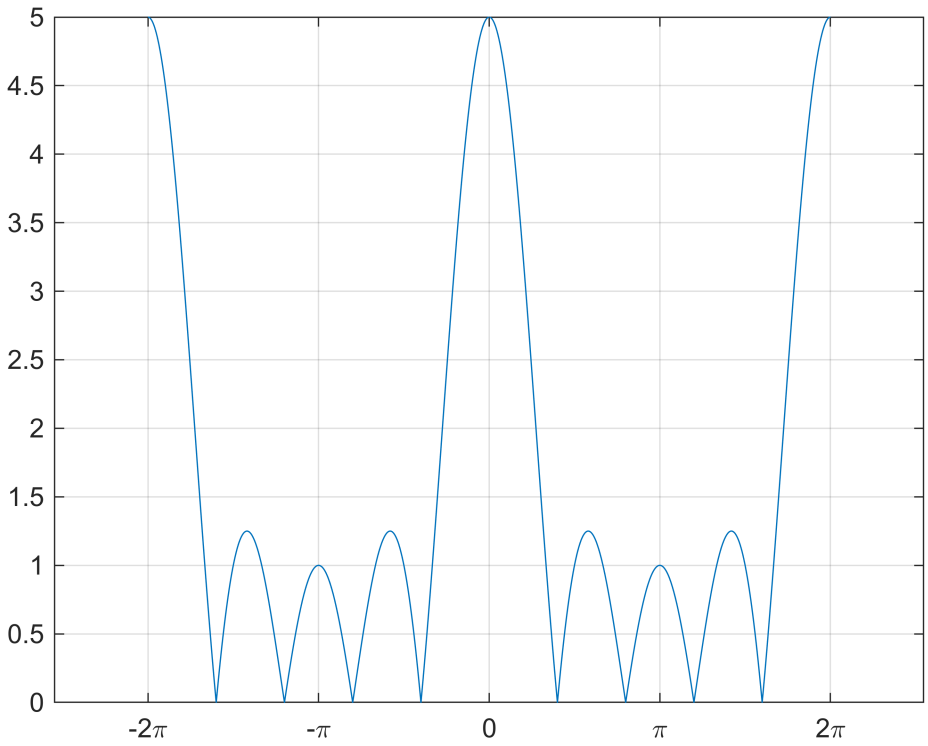
生成$R_5(n)$

```
[x,n] =rec_seq(0,5,-5,8);
stem(n,x);
grid on
axis([-5,8,0,1.1]);
xlabel('n');
ylabel('$R_5(n)$',Interpreter='latex')
```

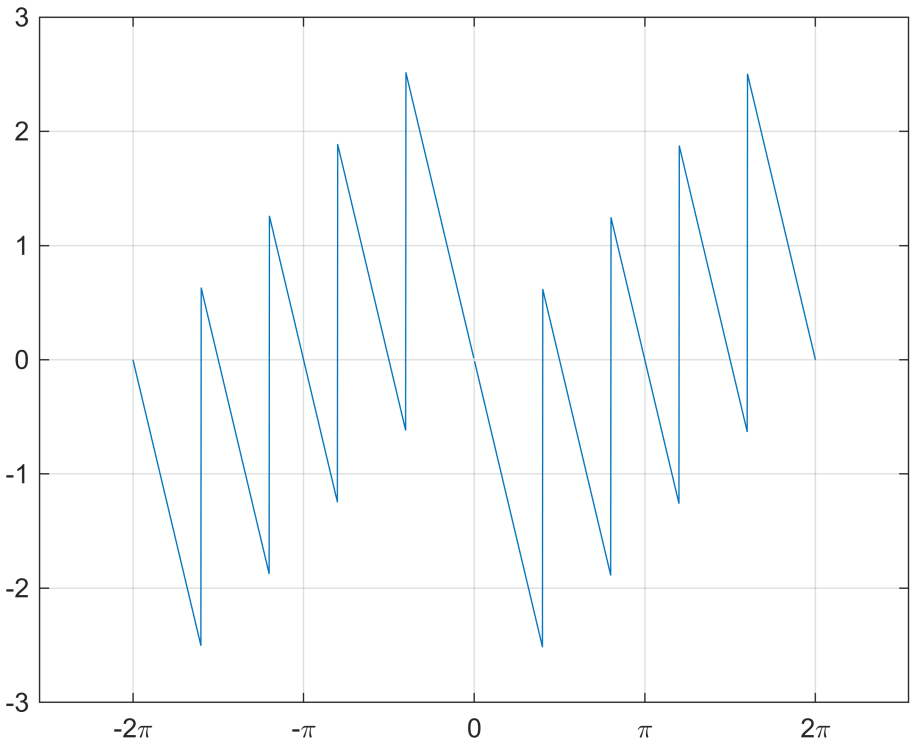


计算 R(n)的 DTFT

```
w = -2*pi:(2*pi)/1000:2*pi;
X = (1-exp(-1i*w*length(x(x==1))))./(1-exp(-1i*w)); % R(n)的 DTFT
magX = abs(X); % X 的幅值
angX = angle(X);% X 的相位
plot(w,magX);
xticks([-3*pi -2*pi -pi 0 pi 2*pi 3*pi])
xticklabels({'-3\pi','-2\pi','-\pi','0','\pi','2\pi','3\pi'})
grid on
```



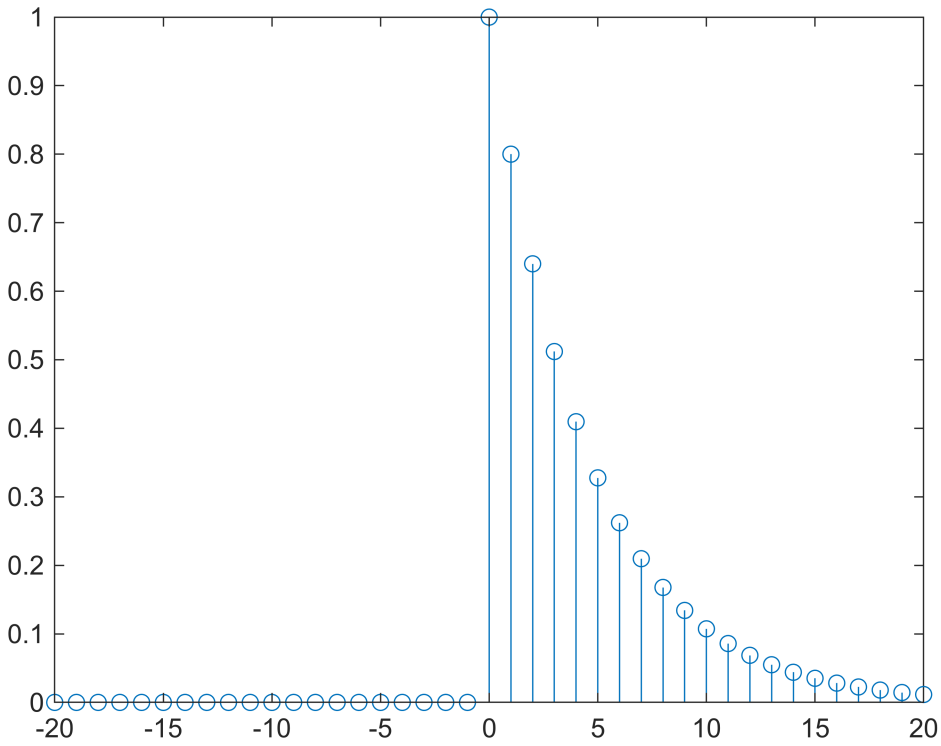

```
plot(w,angX);
xticks([-3*pi -2*pi -pi 0 pi 2*pi 3*pi])
xticklabels({'-3\pi','-2\pi','-\pi','0','\pi','2\pi','3\pi'})
grid on
```



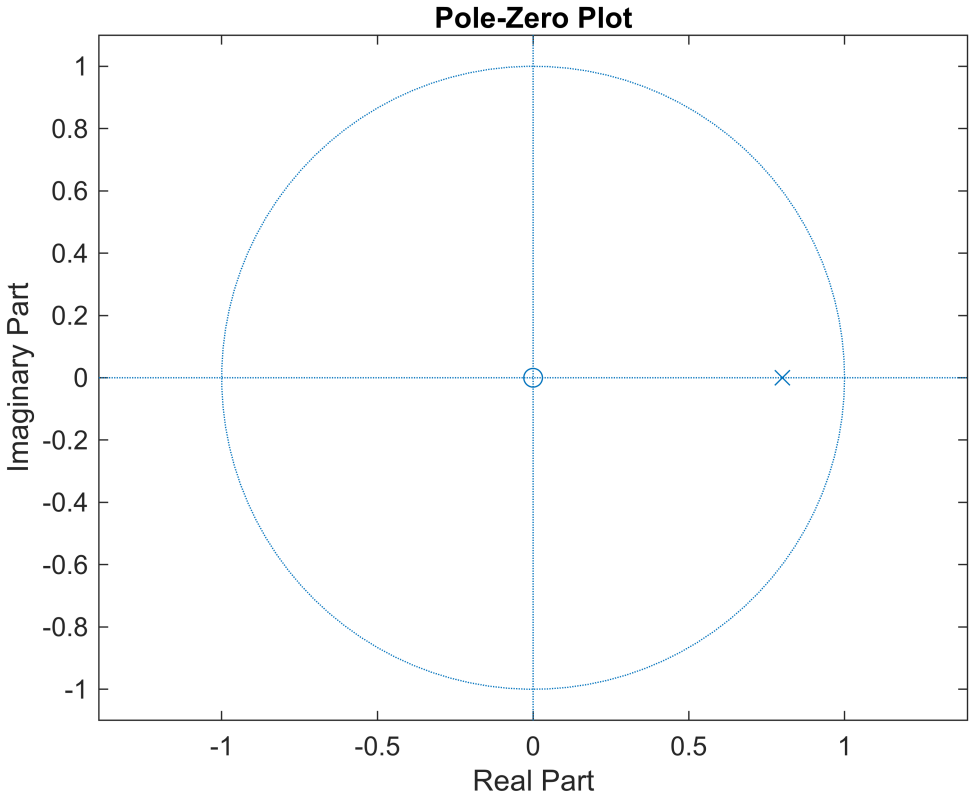
差分方程

a = 0.8

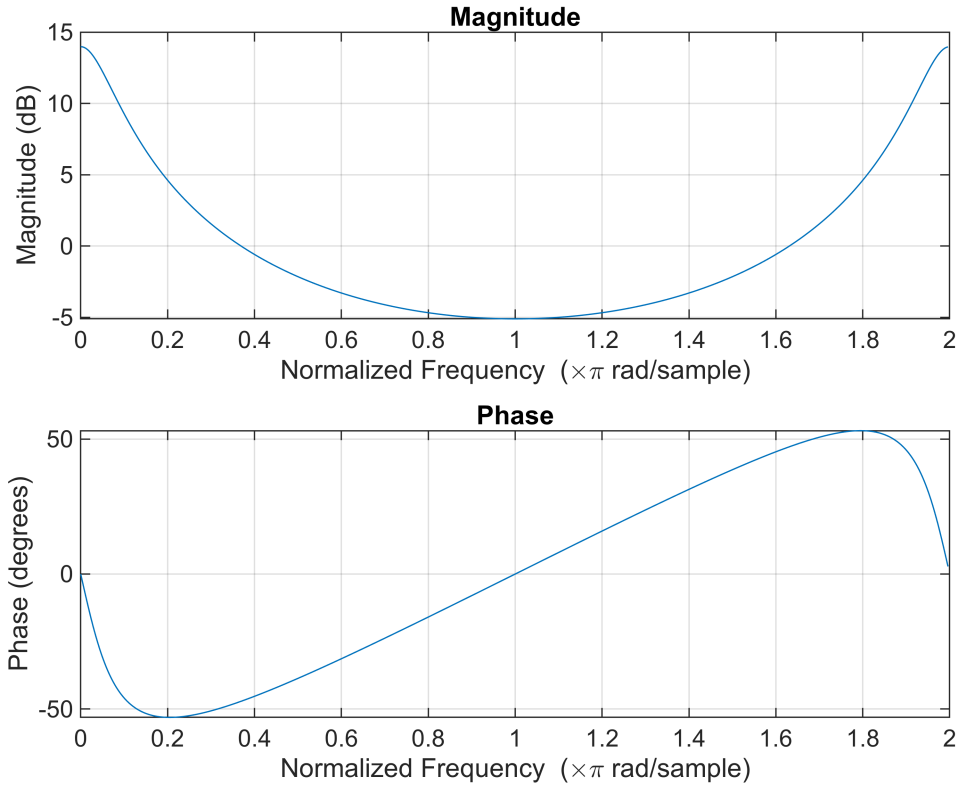
```
a = [1,-0.8];
b = 1;
n = -20:1:20;
h = impz(b,a,n);
stem(n,h)
```


1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-20
-15
-10
-5
0
5
10
15
20

```
zplane(b,a)
```

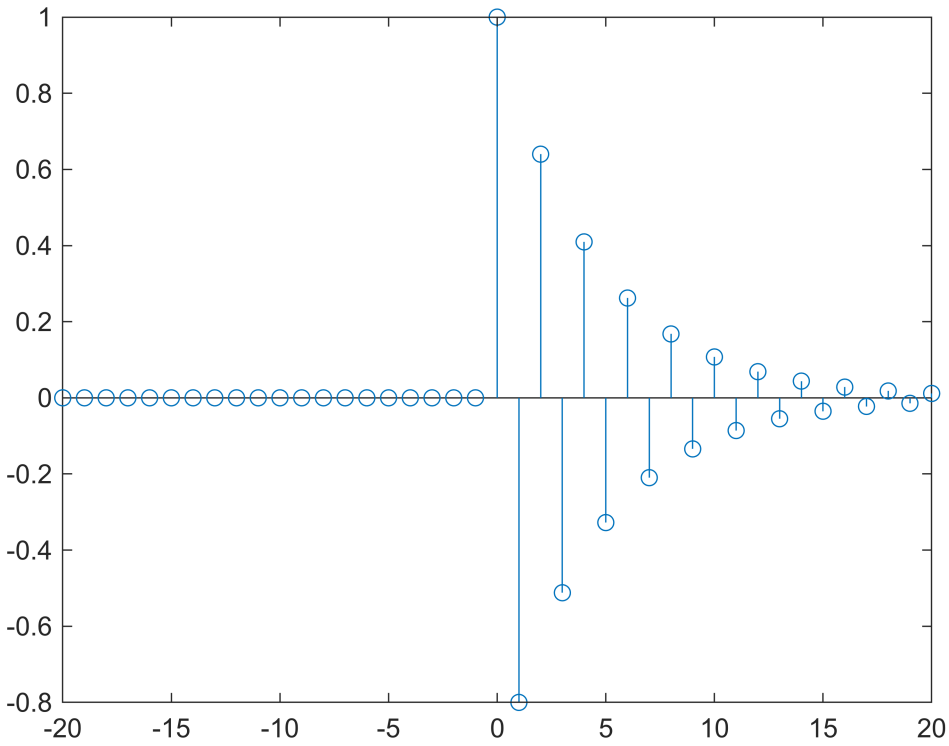

Pole-Zero Plot
Imaginary Part
Real Part
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1
-0.5
0
0.5
1

```
freqz(b, a,'whole');
```

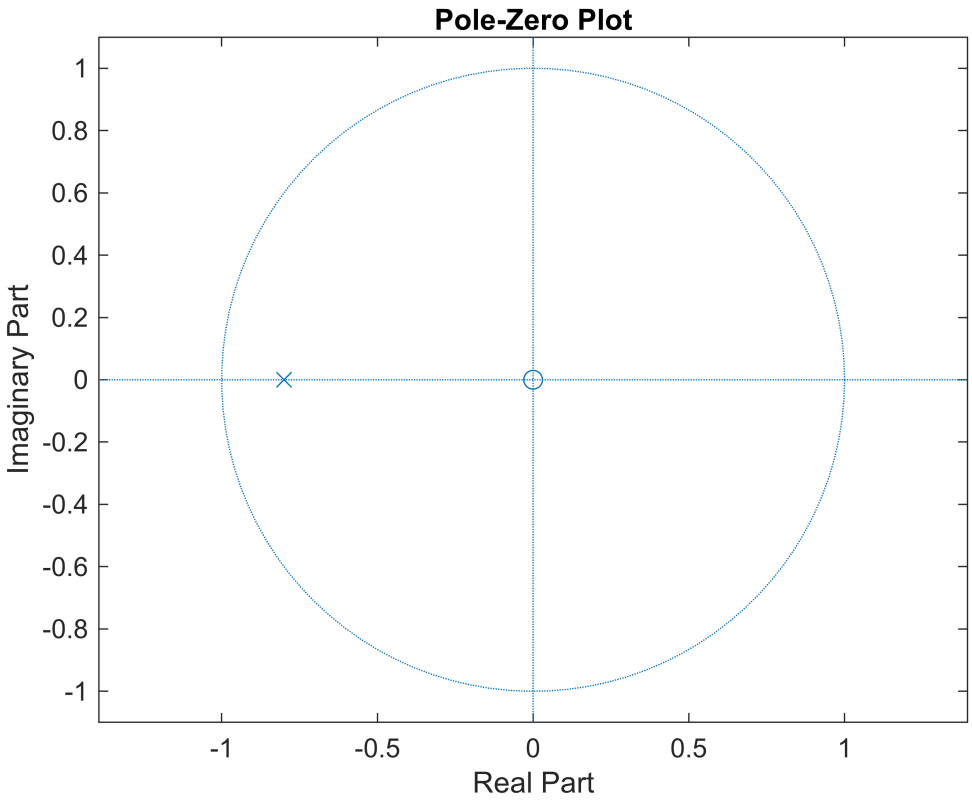


a = -0.8

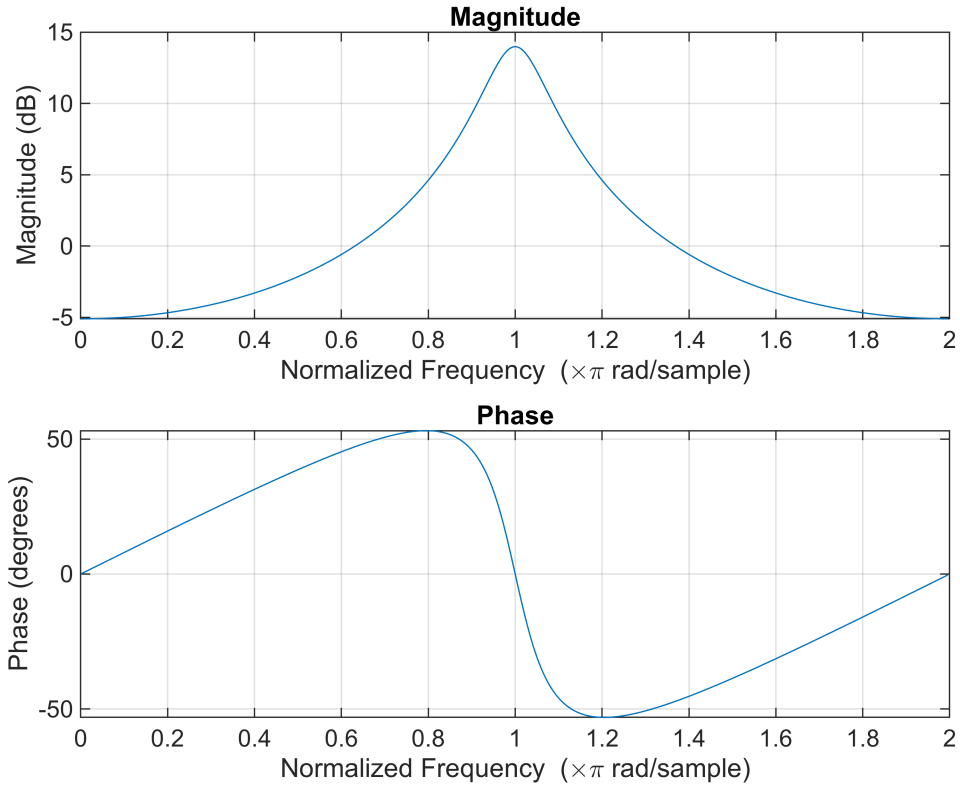
```
a = [1,0.8];
b = 1;
n = -20:1:20;
h = impz(b,a,n);
stem(n,h)
```


1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-20
-15
-10
-5
0
5
10
15
20

```
zplane(b,a)
```


Pole-Zero Plot
Imaginary Part
Real Part
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1
-0.5
0
0.5
1

```
freqz(b, a,'whole');
```




```
function [x,n] = rec_seq(n0,n3,n1,n2)
    % 生成 n1~n2 的矩形序列，n0，n3-1 处跳变
    n = n1:n2;
    x = ((n-n0)>=0) - ((n-n3)>=0);
end
```