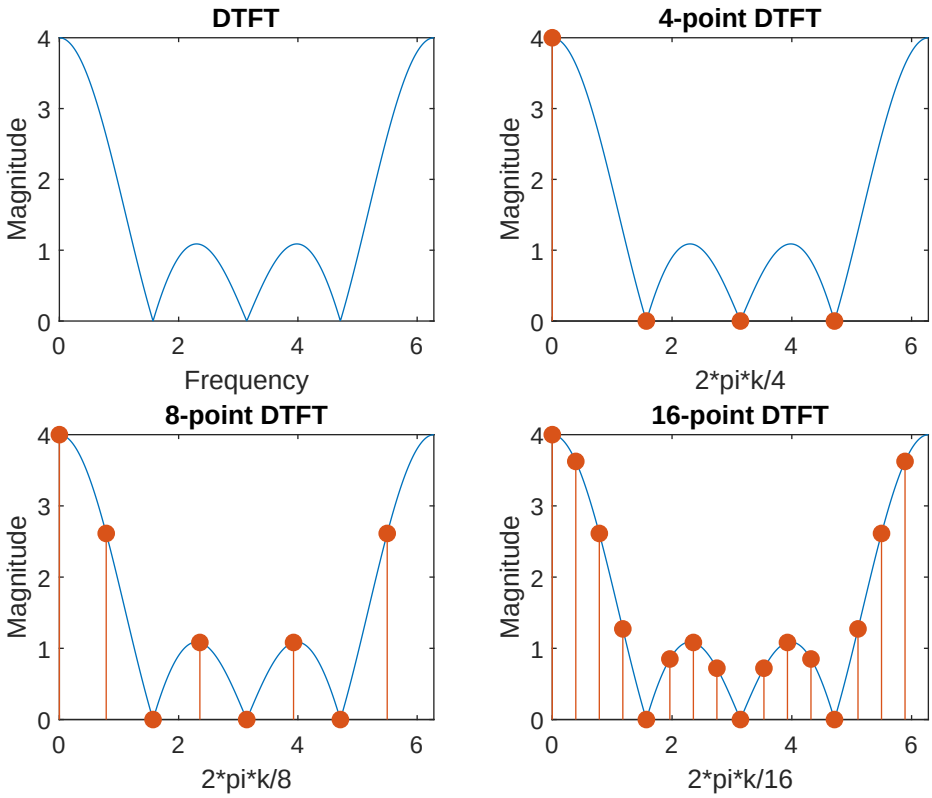
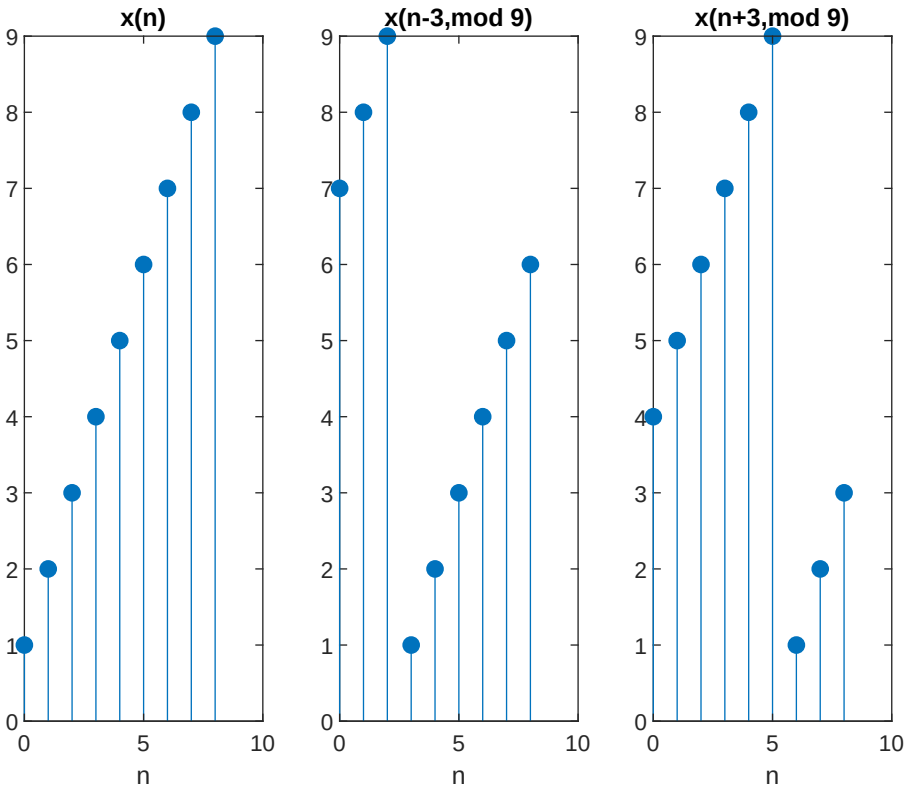
```
clc;
clear all;
close all;

%DTFT
w=0:0.01:2*pi;
Xw=1+exp(-j*w)+exp(-j*2*w)+exp(-j*3*w);

%4-point DTFT
xn=ones(1,4);
N=4;
n=0:N-1;
k=0:N-1;
WN=exp(-j*2*pi/N*n'*k);
Xk=xn*WN;

subplot(221);
plot(w,abs(Xw));
xlabel('Frequency');
ylabel('Magnitude');
title('DTFT');

subplot(222);
plot(w,abs(Xw));hold on
stem(2*pi*k/N,abs(Xk),'filled');
xlabel('2*pi*k/4');
ylabel('Magnitude');
title('4-point DTFT');

%8-point DTFT
clear N;
xn=[ones(1,4) zeros(1,4)];
N=8;
n=0:N-1;
k=0:N-1;
WN=exp(-j*2*pi/N*n'*k);
Xk=xn*WN;

subplot(223);
plot(w,abs(Xw));hold on
stem(2*pi*k/N,abs(Xk),'filled');
xlabel('2*pi*k/8');
ylabel('Magnitude');
title('8-point DTFT');

%16-point DTFT
clear N;
xn=[ones(1,4) zeros(1,12)];
N=16;
n=0:N-1;
k=0:N-1;
WN=exp(-j*2*pi/N*n'*k);
Xk=xn*WN;
```

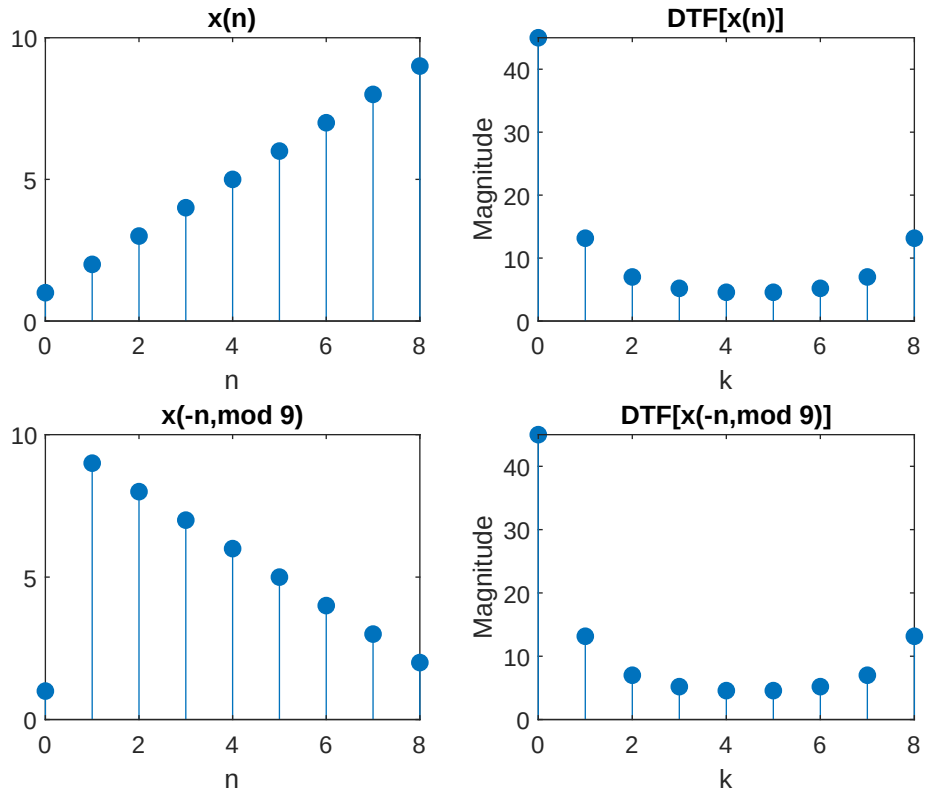
```
subplot(224);
plot(w,abs(Xw));hold on
stem(2*pi*k/N,abs(Xk),'filled');
xlabel('2*pi*k/16');
ylabel('Magnitude');
title('16-point DTFT');
```


DTFT
Magnitude
Frequency
4-point DTFT
Magnitude
2*pi*k/4
8-point DTFT
Magnitude
2*pi*k/8
16-point DTFT
Magnitude
2*pi*k/16

```
clc;
clear all;
close all;

N=9;
n=0:N-1;
x=[1 2 3 4 5 6 7 8 9];
subplot(131);
stem(n,x,'filled');
xlabel('n');
title('x(n)');

%x(n-3,mod 9)
n1=mod(n-3,N);
y1=x(n1+1);
subplot(132);
stem(n,y1,'filled');
xlabel('n');
title('x(n-3,mod 9)');

%x(n+3,mod 9)
n2=mod(n+3,N);
y2=x(n2+1);
subplot(133);
stem(n,y2,'filled');
xlabel('n');
title('x(n+3,mod 9)');
```


x(n)
x(n-3,mod 9)
x(n+3,mod 9)
0
1
2
3
4
5
6
7
8
9
0
5
10
n

```
clc;
clear all;
close all;

N=9;
n=0:N-1;
x=[1 2 3 4 5 6 7 8 9];

subplot(221);
stem(n,x,'filled');
xlabel('n');
title('x(n)');

%DFT[x(n)]
k=0:N-1;
WN=exp(-j*2*pi/N*n'*k);
Xk=x*WN;

subplot(222);
stem(k,abs(Xk),'filled');
xlabel('k');
ylabel('Magnitude');
title('DTF[x(n)]');

%x(-n,mod 9)
n1=mod(-n,N);
y1=x(n1+1);
subplot(223);
stem(n,y1,'filled');
xlabel('n');
title('x(-n,mod 9)');

%DFT[x(-n,mod 9)]
WN=exp(-j*2*pi/N*n'*k);
Xk=y1*WN;

subplot(224);
stem(k,abs(Xk),'filled');
xlabel('k');
ylabel('Magnitude');
title('DTF[x(-n,mod 9)]');
```


x(n)
10
5
0
0
2
4
6
8
n
DTF[x(n)]
Magnitude
40
30
20
10
0
0
2
4
6
8
k
x(-n,mod 9)
10
5
0
0
2
4
6
8
n
DTF[x(-n,mod 9)]
Magnitude
40
30
20
10
0
0
2
4
6
8
k