

DFT linearity property

```
Clc;  
close all;  
clear all;  
N=4  
x1 = [2 3 4 5]  
x2 = [1 3 5 7]  
a =2  
b = 3  
n1=length(x1);  
n2=length(x2);  
x1=[x1 zeros(1,N-n1)];  
x2=[x2 zeros(1,N-n2)];  
x3 = a*x1*1+b*x2  
R3= fft (x3,N)  
R1= fft (x1,N);  
R2= fft (x2,N)  
R4=a*R1+b*R2  
If R3==R4  
    disp('Linearity property Verified.')  
else  
    disp('Linearity property not Verified.')  
end
```

DFT Time shift property

```
Clc;  
close all;  
clear all;  
x=[2 5 7 9]  
N=4  
m=2  
y=circshift(x,[0 m])  
D=fft(y,N)  
X=fft(x,N)  
k=0;N-1;  
w=exp(-i*2*pi*k*m/N);  
X1=w.*X  
DFT Frequency shift property  
x=[3 4 5 6]  
m=2  
N=4  
X=fft(x,N)  
X1=circshift(x,[0 m])  
disp('shifted DFT sequence.');//  
disp(X1);  
n=1;N;  
w=exp((2*i*pi*(n-1)*(m))/N)  
r1=w.*x  
X2=fft(r1,N)
```

DFT convolution property

```
clc;  
close all;  
clear all;  
X=[1 1 1 1]  
h=[2 3 4 5]  
N=8  
N1=4  
N2=4  
N=max(N1,N2);  
x=[x zeros(1,N-N1)];  
h=[h zeros(1,N-N2)];  
N=max (N1,N2);  
y=cconv(x,h,N);  
disp(y)% Circular convolution  
n = 0:1:N-1  
X = fft(x);  
H= fft(h);  
Y= fft(y)  
YI=X.*H
```

DFT multiplication property

```
[x1(n)*x2(n)=(1/N)*circonv(X1(k)*X2(k))]  
clc;  
close all;  
clear all;  
x1=[1 4 6 8]  
x2=[1 3 5 7]  
N1=4  
N2=4  
N=max(N1,N2);  
x3=(x1).*(x2);  
X1=fft(x1,N);  
N1=4;  
X2=fft(x2,N);  
N2=4;  
D=fft(x3,N)  
C=cconv(X1,X2,N);  
C=C/N  
if D==C  
disp('multiplication property Verified.')  
else  
disp('multiplication property Verified.')  
end
```

DFT Parseval's Theorem

clear all:

x1=[1 3 5 7]

x2=[2 4 6 8]

N=4

E=100;

x3=x1.*x2;

E=sum (x3)

display(E);

X1= fft (x1,N)

X2= fft (x2,N)

X4=conj(X2);

X3=(X1.*X4);

P = 100;

X3=X3/N;

P= sum (X3)

display(P);

E==P

disp('Parseval property Verified.')

else

disp('Parseval property not Verified.')

end

```

FIR FILTER % Blackman Window
Rp=(0.25) if Rs<=74 & Rs>53
Rs=(20) N=ceil(12/(Ws-Wp))
Wp=(0.2*3.14) y=blackman(N);
Ws=(0.3*3.14) figure, subplot(2,1,1), stem(y);title('Blackman Window'); end

%Rectangular Window B=firl(N-1,Wp,y)
if Rs<=21 subplot(2,1,2),stem(B);title('Impulse response of FIR Lowpass Filter');

N=ceil(4/(Ws-Wp)) figure, freqz(B,1);
y=boxcar(N); title('Frequency response of FIR Lowpass Filter')

figure, subplot(2,1,1),stem(y); title('Rectangular Window'); end

% Bartlett Window
If Rs<=25& Rs > 21
N=ceil(8/(Ws-Wp))

y=bartlett(N);

figure, subplot(2,1,1), stem(y);title('Bartlett Window'); end

% Hanning Window
if Rs<=44& Rs>25
N=ceil(8/(Ws-Wp))

y=hanning(N);

figure, subplot(2,1,1),stem(y); title('Hanning Window'); end

% Hamming Window
if Rs<=53 & Rs>44
N=ceil(8/(Ws-Wp))

Y=hamming(N);

figure, subplot(2,1,1),stem(y);title('Hamming Window');end

```

BUTTERWORTH

```
rp=1 ;
rs=6 ;
fp=1500
fs=2000
Fs=8000
wp=2*fp/Fs
ws=2*fs/Fs
[n,wc]=buttord(wp,ws,rp,rs)
[p,q]=butter(n,wc);
freqz(p,q,512,1/Fs)
title(' IIR BUTTERWORTH LOW PASS FILTER');
```

CHEBYSHEV FILTER

```
clc;
clear all;
rp=0.2
rs=45
wp=1300
ws =1500
fs =10000
w1=2*wp/fs
w2=2*ws/fs
[n,wn] = cheblord(w1,w2,rp,rs)
[b,a] =cheby 1(n, rp, wn)
freqz(b,a,512,1/fs);
grid on;
```


