



# **MATLAB**

## **CH\_5**

# 離散時間傅立葉轉換對



$$x[n] = \frac{1}{2\pi} \int_{2\pi} X(e^{j\omega}) e^{j\omega n} d\omega$$

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

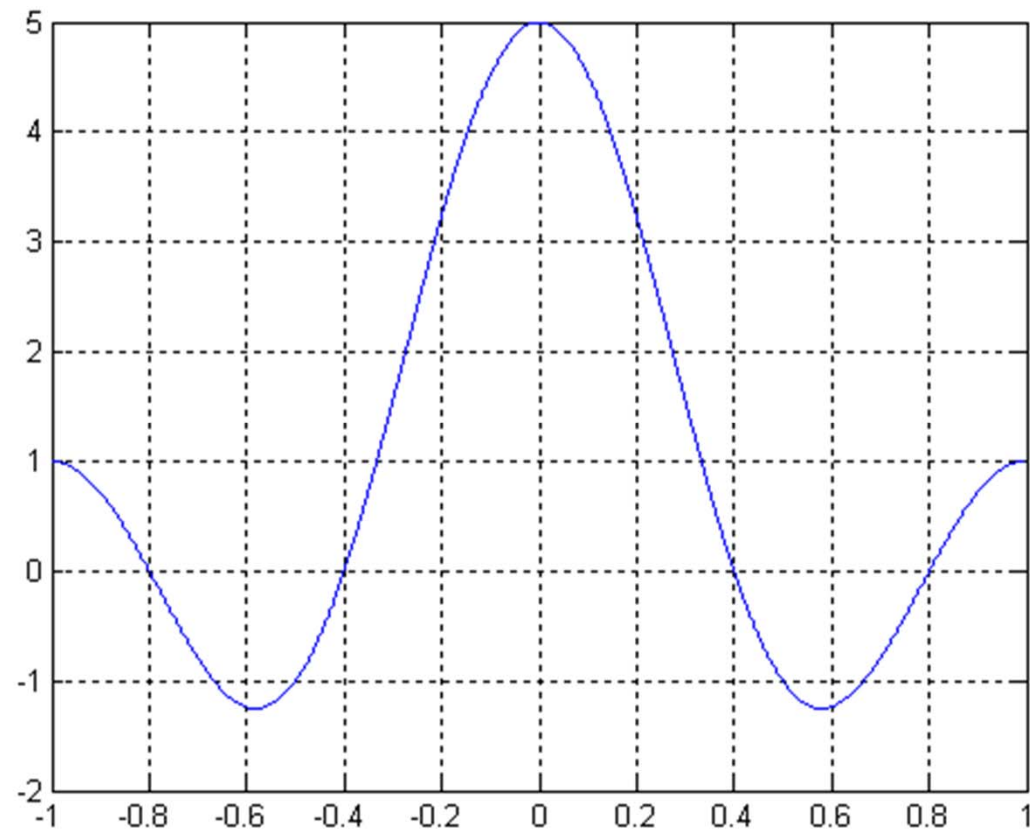
# 例子1



$$x[n] = \begin{cases} 1, & |n| \leq 2 \\ 0, & |n| > 2 \end{cases}$$

```
i=1;
X=ones(1,5);
for w=-pi:0.001:pi
    E=exp(-j*[-2:2]*w);
    Xf(i)=X*E.';
    i=i+1;
end
plot([-pi:0.001:pi]/pi,Xf)
grid on
```

# 結果圖



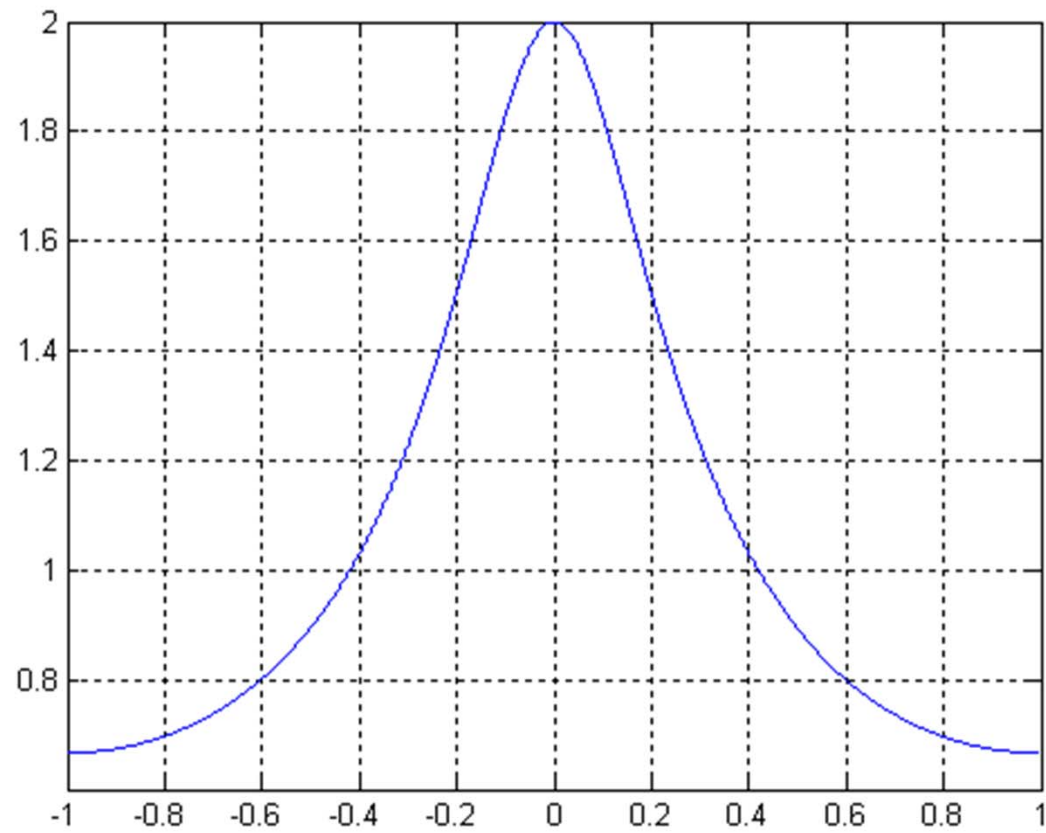
## 例子2



$$x[n] = 0.5^n u[n]$$

```
i=1;  
X=0.5.^[0:49];  
for w=-pi:0.001:pi  
    E=exp(-j*[0:49]*w);  
    Xf(i)=X*E.';  
    i=i+1;  
end  
plot([-pi:0.001:pi]/pi,abs(Xf))  
grid on
```

# 結果圖



## 例子3



### 反傅立葉轉換

```
syms w
```

```
X = sin(w*(2+1/2)) / sin(w/2);
```

```
n = [-10:10];
```

```
x = double( int( X .* exp(j*w*n) , -pi , pi) ) / (2*pi);
```

```
stem([-10:10],x);
```

## 例子4



近似法  $x[n] \approx \frac{1}{2\pi} \sum_{k=0}^{N-1} X(e^{jk2\pi/N}) e^{jk2\pi n/N} 2\pi / N$

```
w = -pi:0.001:pi;
```

```
X = sin(w*(2+1/2))./sin(w/2);
```

```
for n = -10:10
```

```
    x(n+11) = X*(exp(j*w*n)).'*0.001/2/pi;
```

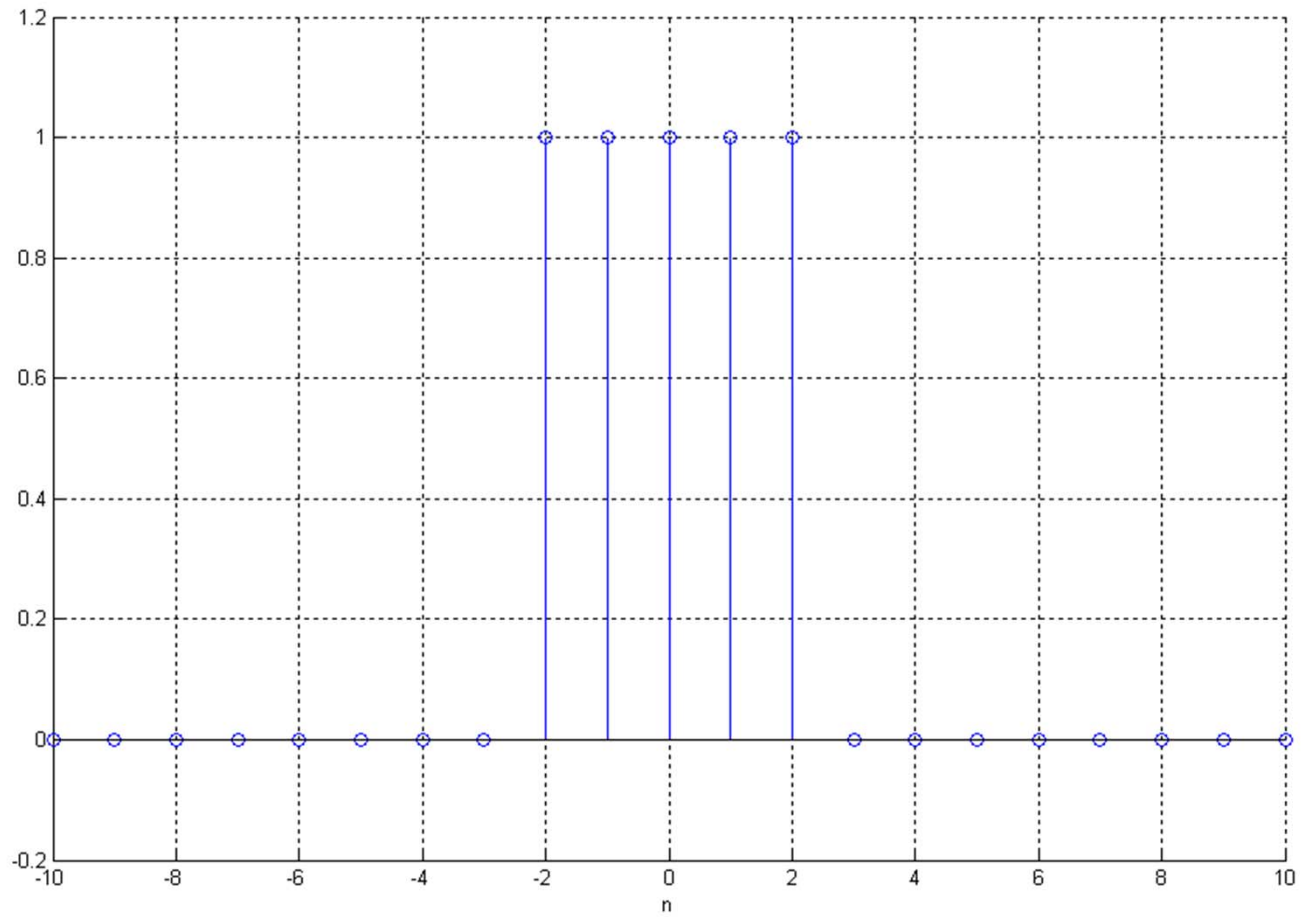
```
end
```

```
figure
```

```
stem([-10:10],x)
```



# 結果圖



# 作業



試做出下列訊號之頻譜(做DTFT)，並從例子所述方法將頻譜成份轉回時域：

$$x[n] = 0.5^{|n|}$$