SAS HW1 106061218 李丞恩

Problem 1

1. $x(t) = \int_{-\infty}^{\infty}\int_{-\infty}^{\infty} x(t) e^{-j2\pi f t} dt \, e^{+j2\pi f t} df$

$$\begin{cases} X(f) = \int_{-\infty}^{+\infty} x(t) e^{-j2\pi f t} dt \\ x(t) = \int_{-\infty}^{+\infty} X(f) e^{j2\pi f t} df \end{cases}$$

2. $x_p(t) = \sum_{k=-\infty}^{+\infty} \frac{1}{T} \int_0^T x_p(t) e^{-j\frac{k2\pi f}{T}} dt \, e^{+j\frac{k2\pi t}{T}}$

$$\begin{cases} X_p[k] = \int_0^T x_p(t) e^{-j\frac{k2\pi t}{T}} dt \\ x_p(t) = \sum_{k=-\infty}^{+\infty} \frac{1}{T} X_p[k] e^{+j\frac{k2\pi t}{T}} \end{cases}$$

Problem 2

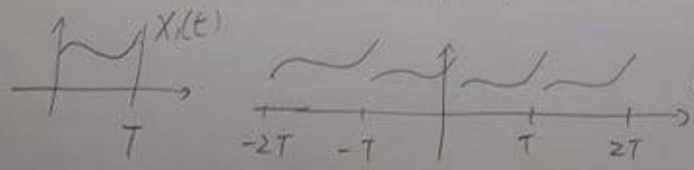
$X_1(f) = \int_0^T x_1(t) e^{-j2\pi f t} dt$

$X_p[k] = \int_0^T x_p(t) e^{-j\frac{k2\pi t}{T}} dt$

$(\because x_p(t) = x_1(t) * \sum_{n=-\infty}^{\infty} \delta(t-nT) = x_1(t)*\delta(t) + x_1(t)*\delta(t-T) + x_1(t)*\delta(t-2T)$

$+ \cdots + x_1(t)*\delta(t+T) + x_1(t)*\delta(t+2T) + \cdots$

$= x_1(t) + x_1(t-T) + \cdots + x_1(t+T) + x_1(t+2T) + \cdots$



(美術從小不及格 圖醜、請見諒)

$\therefore X_p[k] = X_1(f = k \cdot \frac{1}{T})$

Problem 3

1. $x_1(t) = e^{-at}(u(t) - u(t-T))$

$$\rightarrow X_1(f) = \int_0^T e^{-at} e^{-j2\pi f} dt$$

$$= -\frac{1}{a+j2\pi f} e^{-(a+j2\pi f)t}\Big|_0^T$$

$$= \frac{1}{a+j2\pi f}\left(1 - e^{-(a+j2\pi f)T}\right)$$

$$X_p(f) = X_1(f) \sum_{n=-\infty}^{+\infty} \delta(f - n \times \tfrac{1}{T}) \quad \frac{1}{T}$$

$$= \Delta f \sum_{n=-\infty}^{+\infty} X_1(n\Delta f)\delta(f - n\Delta f)$$

$(\Delta f = \frac{1}{T})$

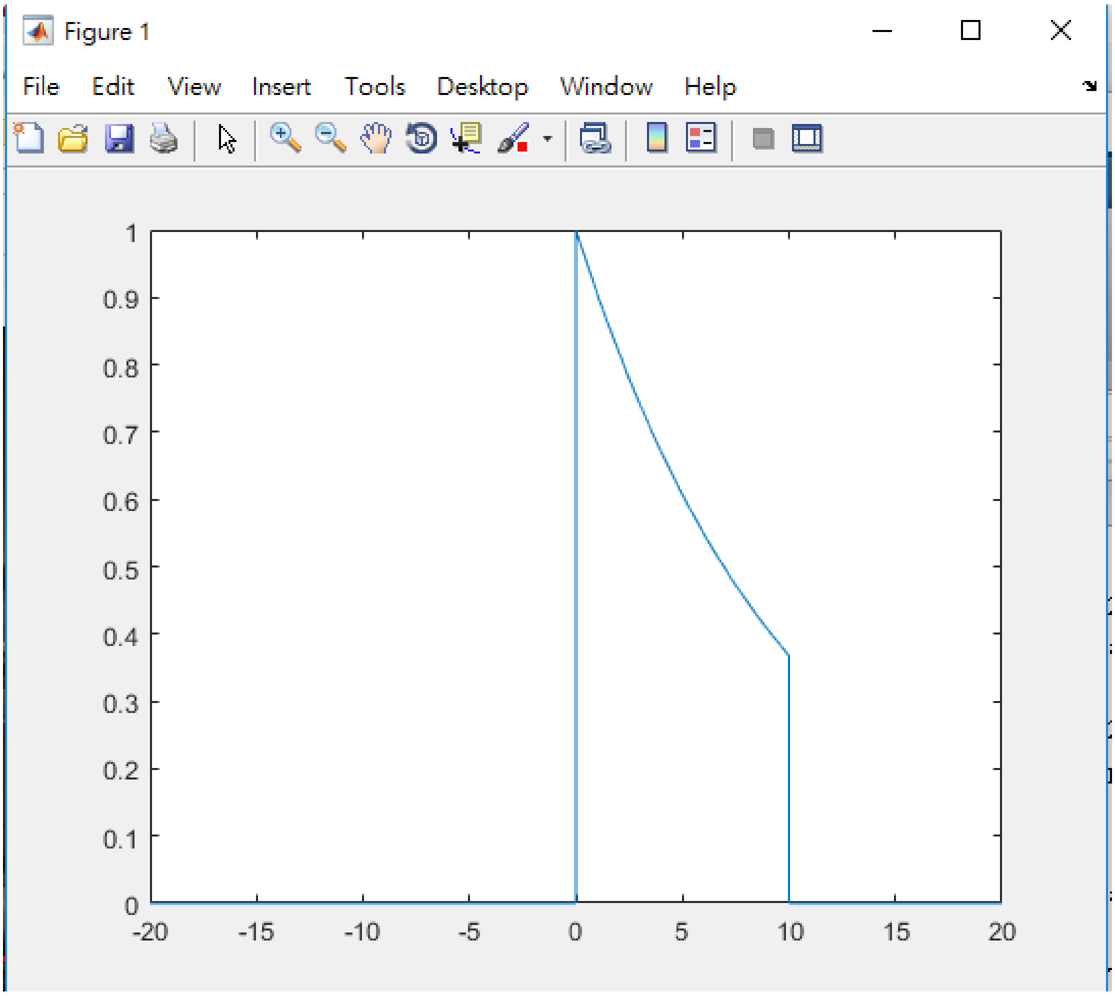


Figure 1
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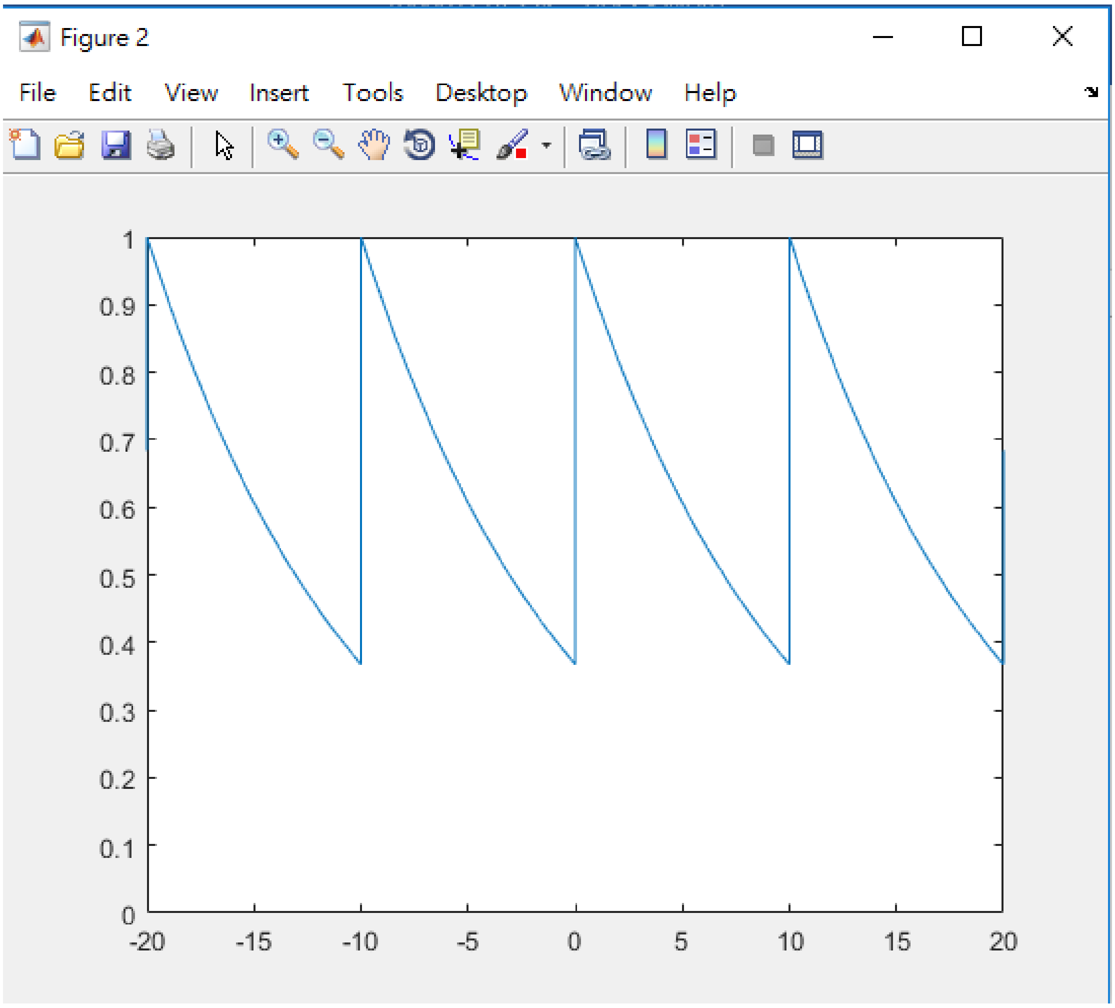
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-20
-15
-10
-5
0
5
10
15
20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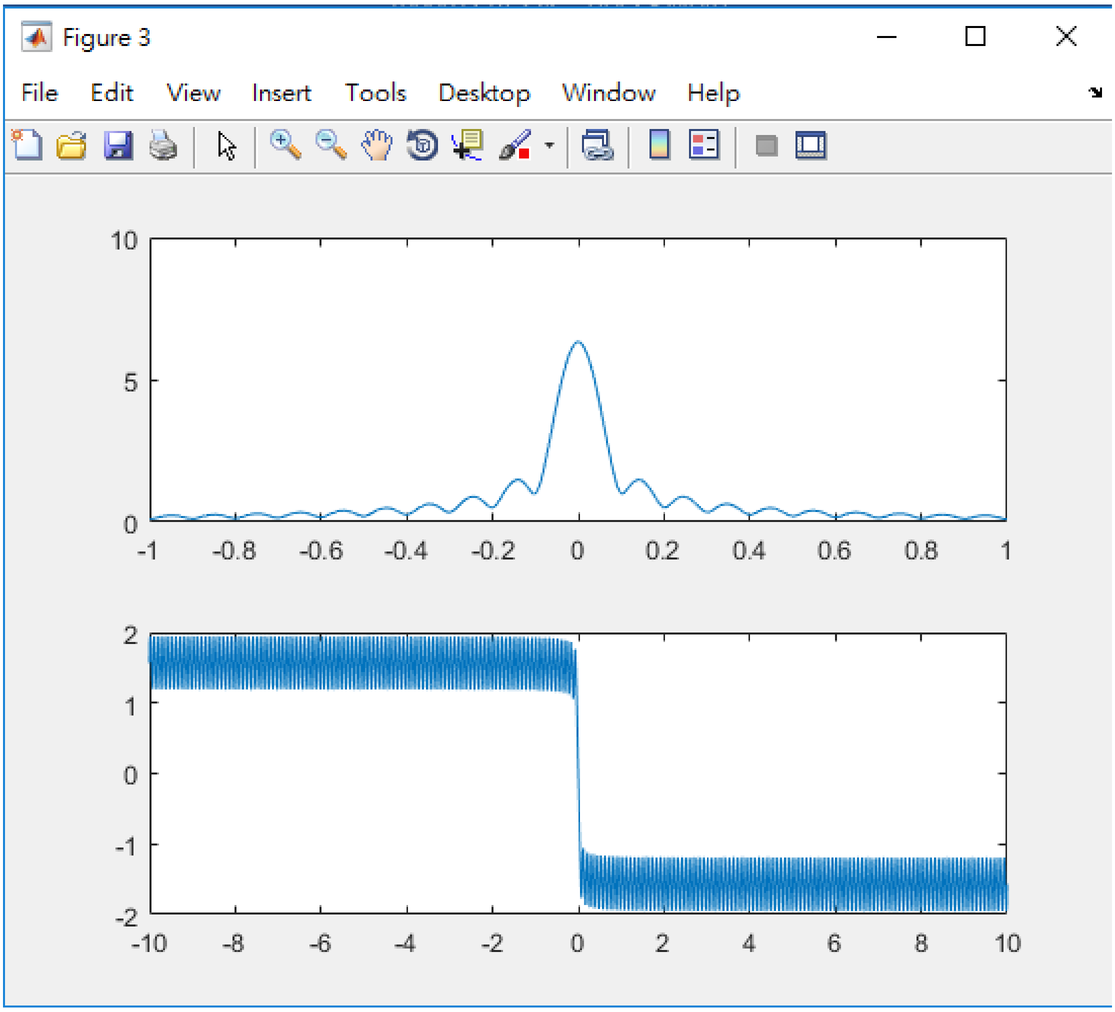
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0
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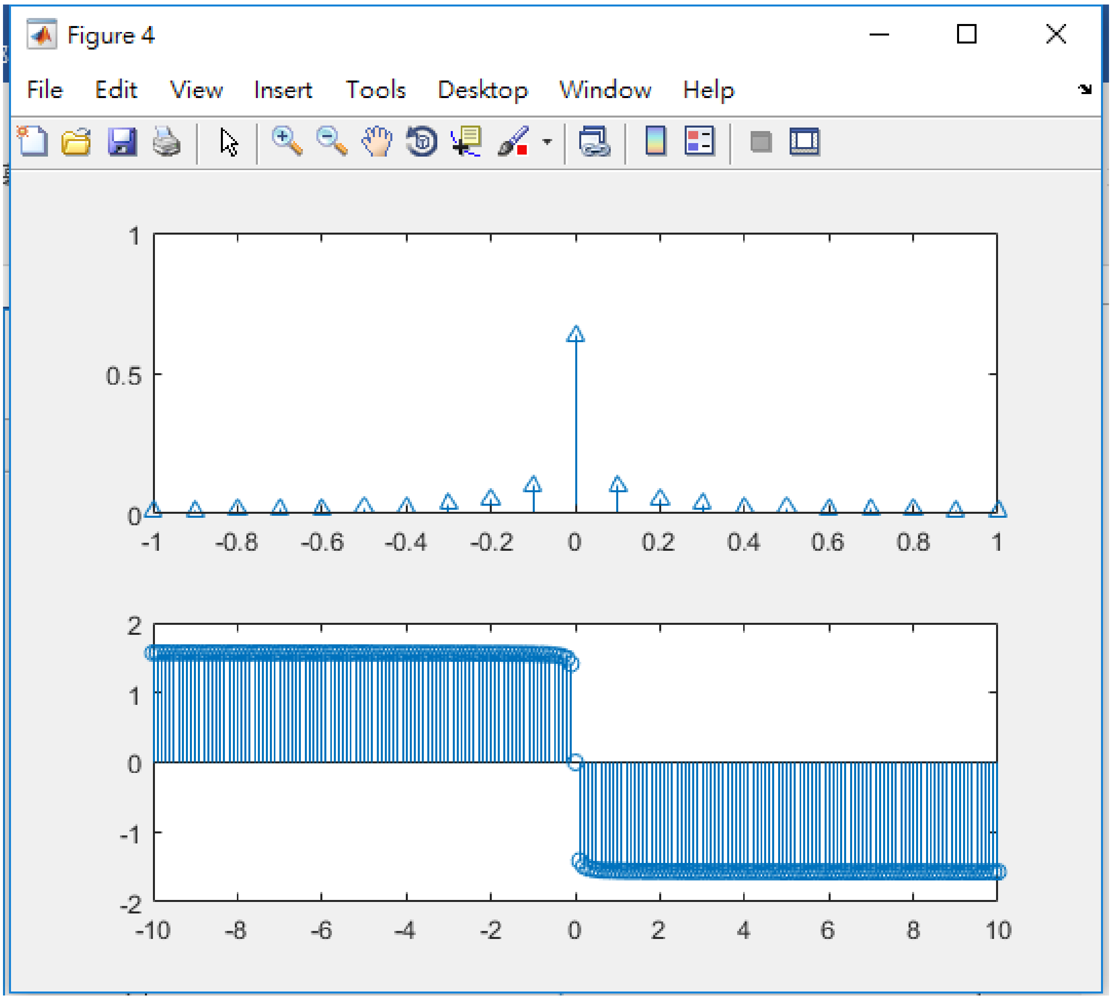
2
1
0
-1
-2
-10 -8 -6 -4 -2 0 2 4 6 8 10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0
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2
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0
-1
-2
-10 -8 -6 -4 -2 0 2 4 6 8 10

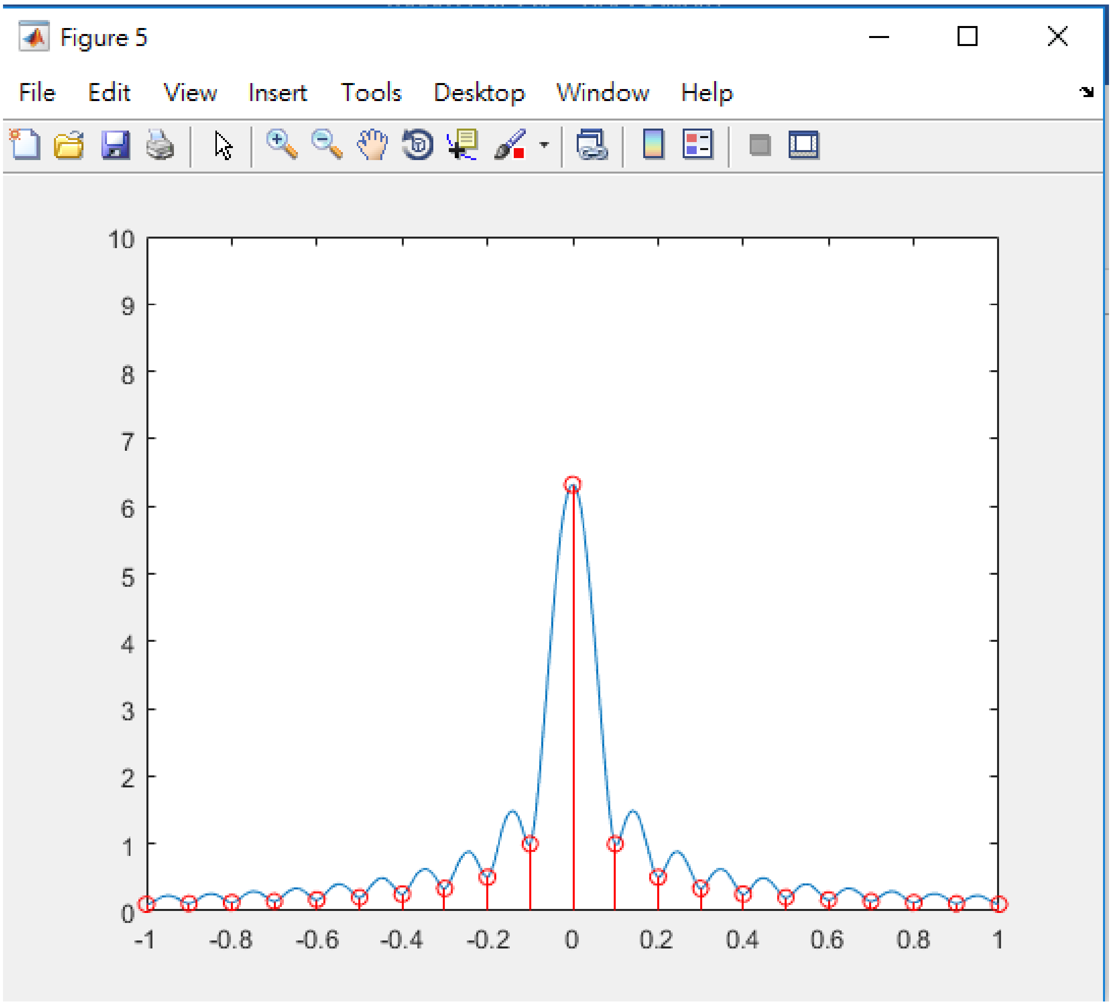
Figure 5
File Edit View Insert Tools Desktop Window Help
10
9
8
7
6
5
4
3
2
1
0
-1 -0.8 -0.6 -0.4 -0.2 0 0.2 0.4 0.6 0.8 1