訊號 HW3 106061151 劉庭得

prob 1.

1. DTFT

$$x_1[n] = \int_{-\frac{1}{2}}^{+\frac{1}{2}} \boxed{\sum_{n=-\infty}^{+\infty} x_1[n] e^{-j2\pi f n}} \, e^{+j2\pi f n} \, df$$

$$\tilde{X}_1(f) = \sum_{n=-\infty}^{+\infty} x_1[n] e^{-j2\pi f n}$$

$$x_1[n] = \int_{-\frac{1}{2}}^{+\frac{1}{2}} \tilde{X}_1(f) e^{+j2\pi f n}$$

2. DTFS

$$x_p[n] = \sum_{k=0}^{N-1} \frac{1}{N} \boxed{\sum_{n=0}^{N-1} x_p[n] e^{-j\frac{k2\pi n}{N}}} \, e^{+j\frac{k2\pi n}{N}}$$

$$\tilde{X}_p[k] = \sum_{n=0}^{N-1} x_p[n] e^{-j\frac{k2\pi n}{N}}$$

$$x_p[n] = \sum_{k=0}^{N-1} \frac{1}{N} \tilde{X}_p[k] e^{+j\frac{k2\pi n}{N}}$$

prob 2.

$$X_1(f) = \sum_{n=-\infty}^{+\infty} x_1[n] e^{-j2\pi f n}$$

$$= \sum_{n=0}^{N-1} x_1[n] e^{-j2\pi f n}$$

$$X_p[k] = \sum_{k=0}^{N-1} x_1[n] e^{-j\frac{k2\pi n}{N}}$$

$$X_p[k] = X_1(f = k\tfrac{1}{N})$$

prob 3.

$$x_1[n] = e^{-an}[u(n) - u(n-N)]$$

$$x_p[n] = x_1[n] * \sum_{l=-\infty}^{+\infty} \delta[n - lN]$$

$$u[n] \rightleftharpoons \frac{1}{1-e^{-j2\pi f}} + \frac{1}{2}\delta(f)$$

$$u[n-N] \rightleftharpoons e^{-j2\pi f N}\left(\frac{1}{1-e^{-j2\pi f}} + \frac{1}{2}\delta(f)\right)$$

$$u[n] - u[n-N] \rightleftharpoons (1 - e^{-j2\pi f N})\left(\frac{1}{1-e^{-j2\pi f}} + \frac{1}{2}\delta(f)\right)$$

$$e^{-an}(u[n] - u[n-N]) \rightleftharpoons (1 - e^{-(a+j2\pi f)N})\left(\frac{1}{1-e^{-(a+j2\pi f)}} + \frac{1}{2}\delta\left(f + \frac{a}{j2\pi}\right)\right)$$

$$= X_1(f) \ \#$$

$$X_p[k] = X_1(f = k\tfrac{1}{N})$$

2. (a)

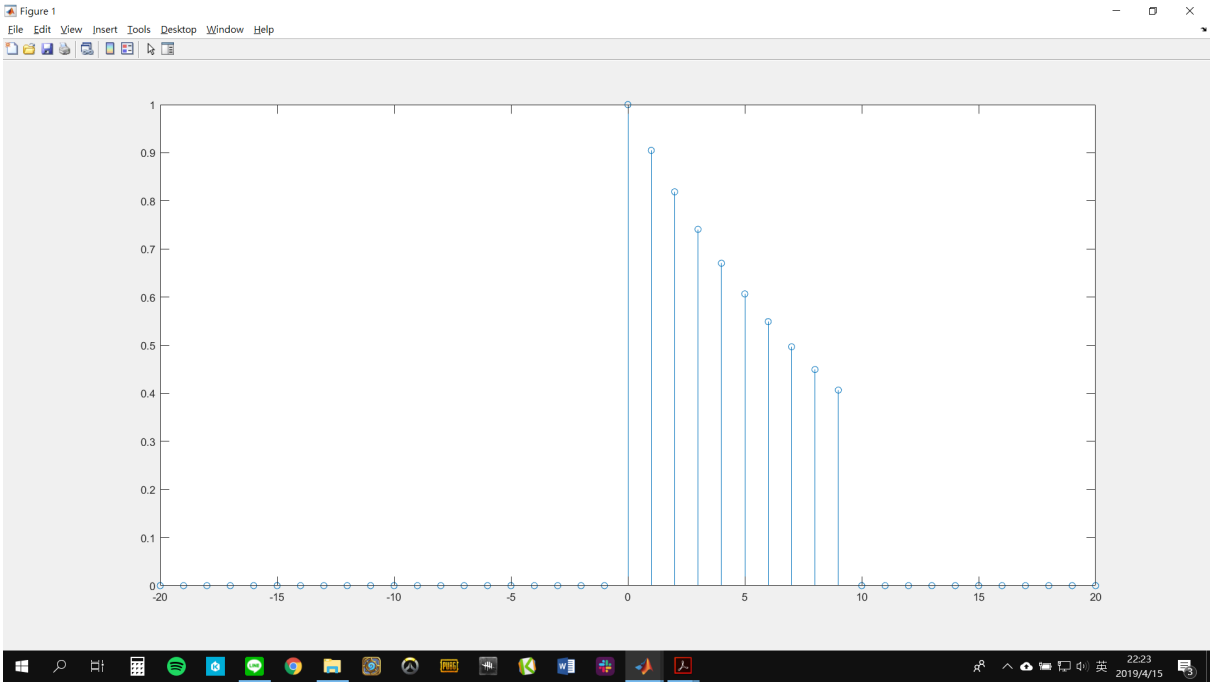
Figure 1
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-5
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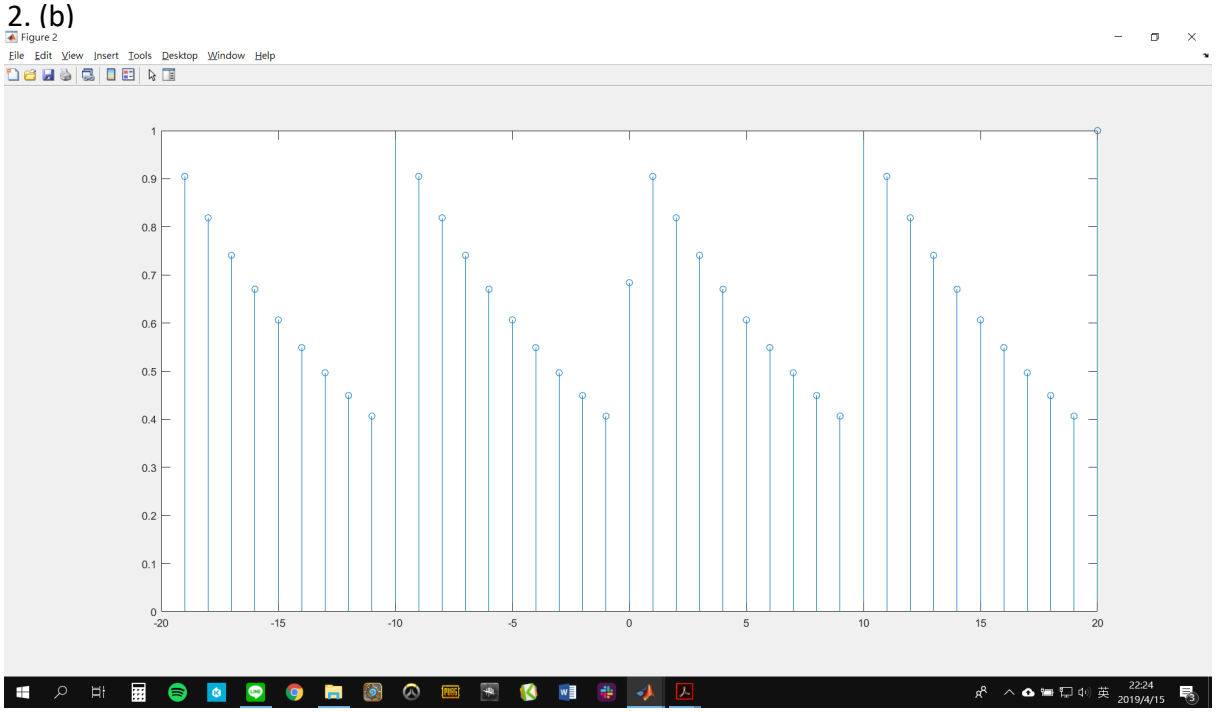
22:23
2019/4/15

2. (b)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2019/4/15

2. (c)

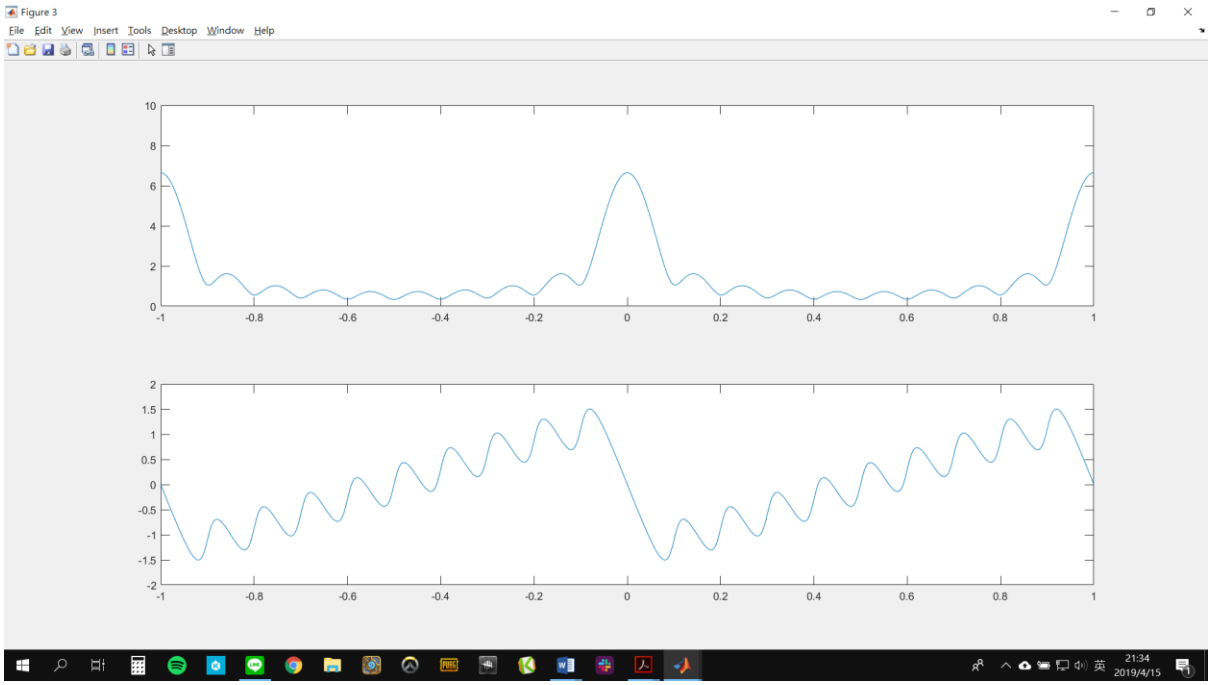
Figure 3
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21:34
2019/4/15

2. (d)

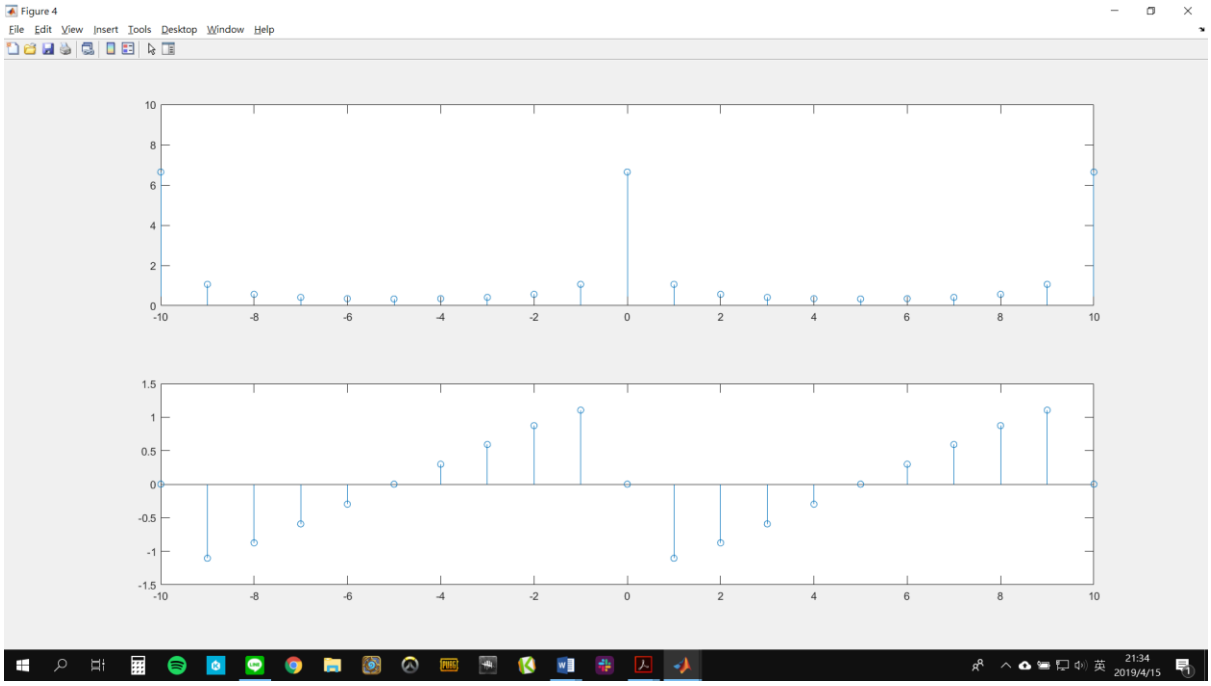
Figure 4
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-1.5
-10 -8 -6 -4 -2 0 2 4 6 8 10
21:34
2019/4/15

2. (e) X1(f)

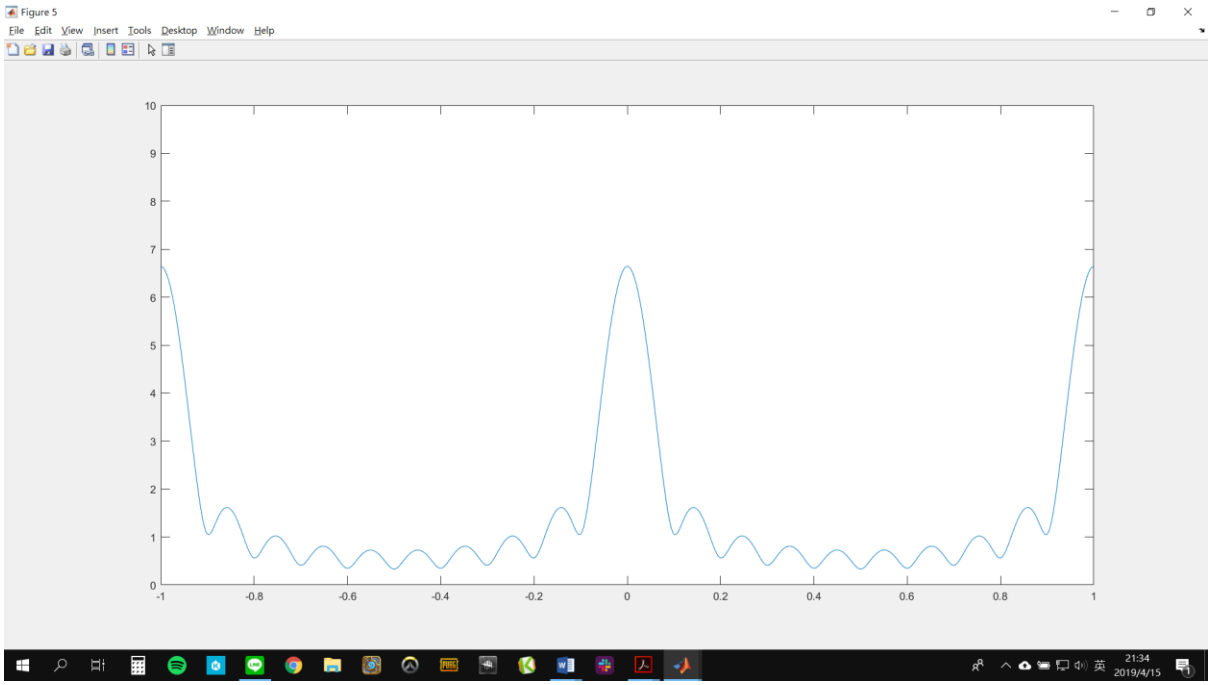
Figure 5
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2. (f) Xp[k]

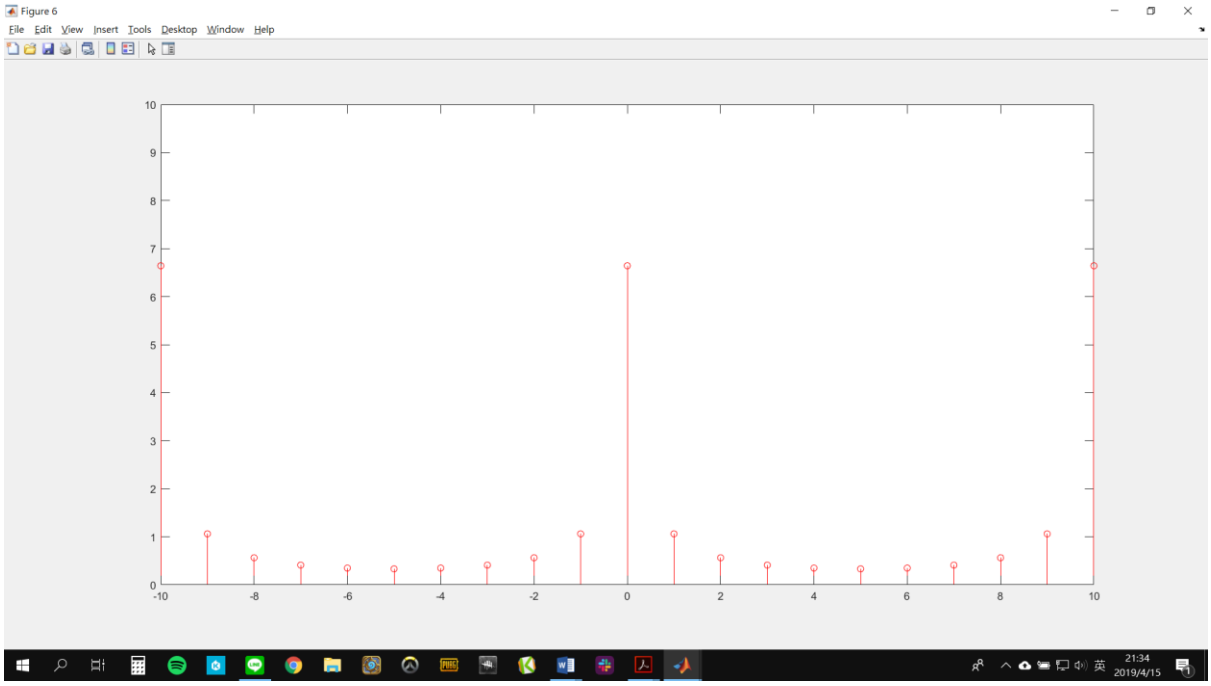
Figure 6
File Edit View Insert Tools Desktop Window Help
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-4
-2
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8
10
21:34
2019/4/15