

hw06_MATLAB

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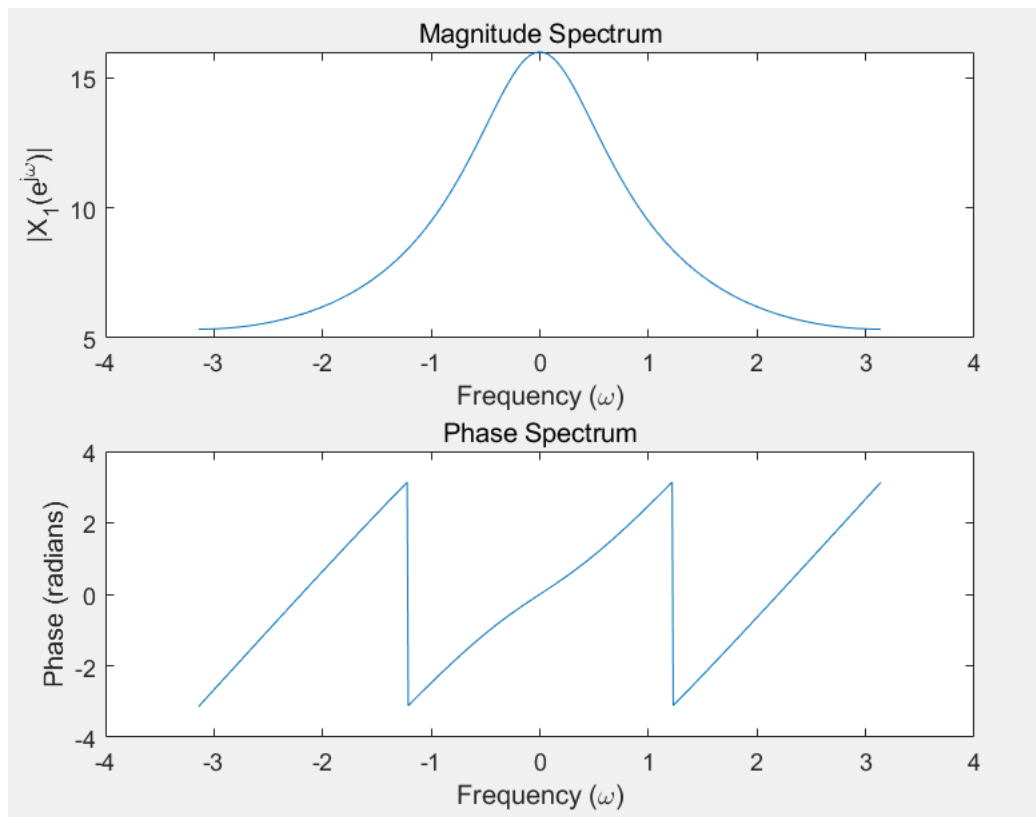
2024 年 4 月 9 日

24(1)

```
1      n = -3:100; % 选择一个足够大的范围以确保序列趋于零
2      x1 = (1/2).^n .* (n >= -3); % 定义序列  $x_1(n)$ 
3      omega = -pi:0.01:pi; % 选择频率范围
4
5      % 计算DTFT
6      X1 = sum(x1 .* exp(-1i * omega' * n), 2);
7
8      % 绘制幅度谱和相位谱
9      subplot(2,1,1);
10     plot(omega, abs(X1));
11     xlabel('Frequency (\omega)');
12     ylabel('|X_1(e^{j\omega})|');
13     title('Magnitude Spectrum');
14
15     subplot(2,1,2);
16     plot(omega, angle(X1));
17     xlabel('Frequency (\omega)');
18     ylabel('Phase (radians)');
19     title('Phase Spectrum');
```

Listing 1: 题 24(1) MATLAB 代码

Answer:



24(2)

```

1      n = 0:100; % 选择一个足够大的范围以确保序列趋于零
2      a = 0.5; % a的值 (可以根据需要调整)
3      omega_0 = pi/4; % \omega_0的值 (可以根据需要调整)
4      x2 = a.^n .* sin(n * omega_0); % 定义序列 x2(n)
5      omega = -pi:0.01:pi; % 选择频率范围
6
7      % 计算DTFT
8      X2 = sum(x2 .* exp(-1i * omega' * n), 2);
9
10     % 绘制幅度谱和相位谱
11     subplot(2,1,1);
12     plot(omega, abs(X2));
13     xlabel('Frequency (\omega)');
14     ylabel('|X_2(e^{j\omega})|');
15     title('Magnitude Spectrum');
16

```

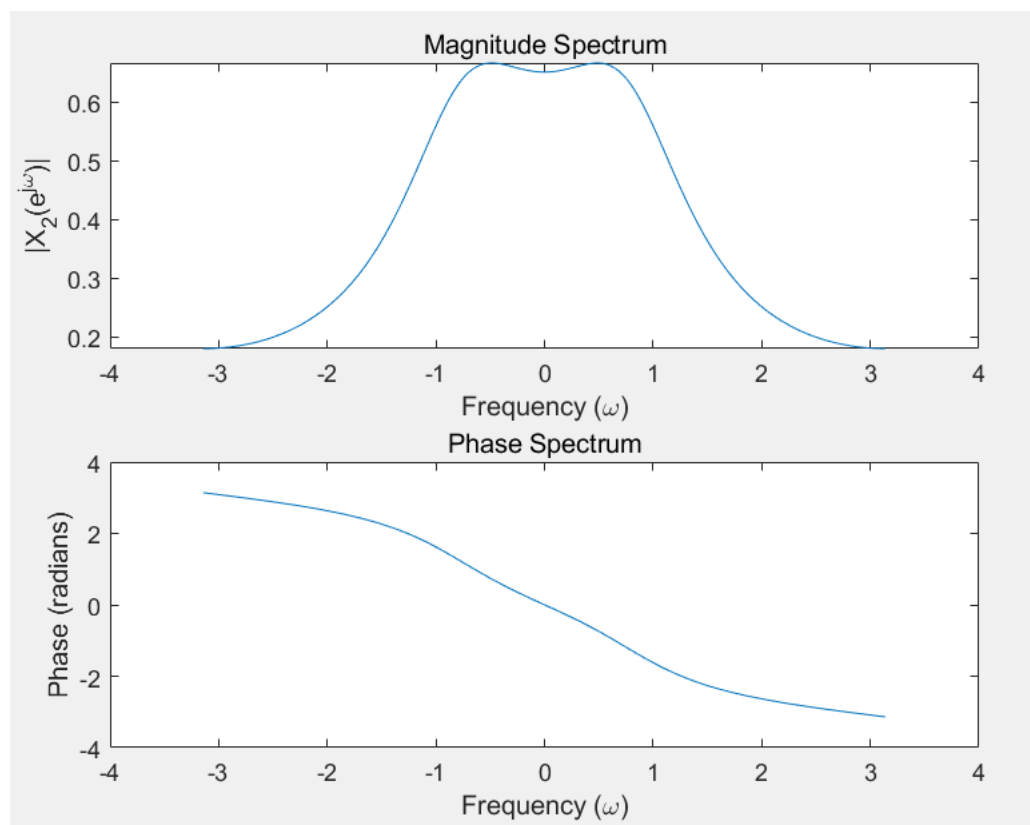
```

17 subplot(2,1,2);
18 plot(omega, angle(X2));
19 xlabel('Frequency (\omega)');
20 ylabel('Phase (radians)');
21 title('Phase Spectrum');

```

Listing 2: 题 24(2) MATLAB 代码

Answer:



24(3)

```

1 k = 0:100; % 选择一个足够大的范围以确保序列趋于零
2 x3 = (1/2).^ (2*k); % 定义序列 x3(k)
3 omega = -pi:0.01:pi; % 选择频率范围
4
5 % 计算DTFT

```

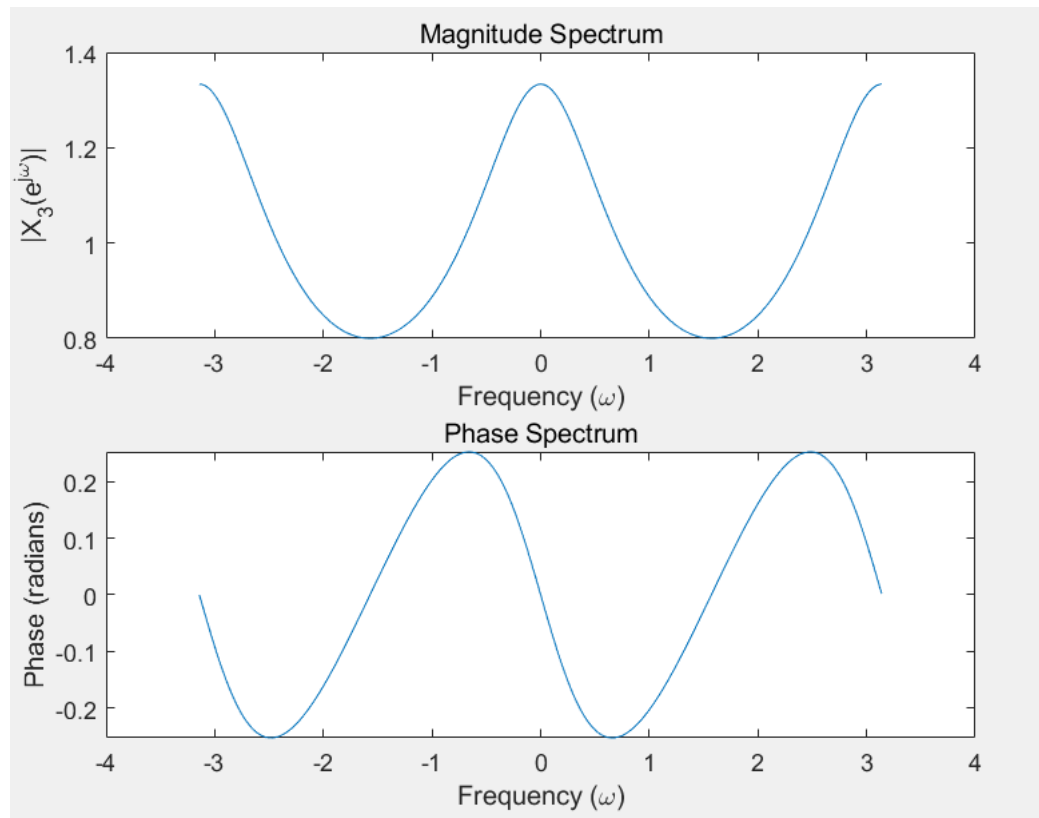
```

6      X3 = sum(x3 .* exp(-1i * 2 * omega' * k), 2);
7
8      % 绘制幅度谱和相位谱
9      subplot(2,1,1);
10     plot(omega, abs(X3));
11     xlabel('Frequency (\omega)');
12     ylabel('|X_3(e^{j\omega})|');
13     title('Magnitude Spectrum');
14
15     subplot(2,1,2);
16     plot(omega, angle(X3));
17     xlabel('Frequency (\omega)');
18     ylabel('Phase (radians)');
19     title('Phase Spectrum');

```

Listing 3: 题 24(3) MATLAB 代码

Answer:



25

```
1      % 定义采样频率和采样间隔
2      fs = 1000; % 采样频率为 1kHz
3      Ts = 1/fs; % 采样间隔
4
5      % 定义周期连续信号的参数
6      A = 1;
7      B = 2;
8
9      % 定义离散时间信号的长度
10     N = 1000; % 采样点数
11
12     % 计算离散时间信号的值
13     n = 0:N-1;
14     xa = A*cos(200*pi*n*Ts) + B*cos(500*pi*n*Ts);
15
16     % 计算离散傅里叶变换
17     X = fft(xa);
18
19     % 绘制离散傅里叶变换结果
20     f = linspace(0, fs*(N-1)/N, N); % 频率轴
21     stem(f, abs(X)); % 绘制幅度谱
22     xlabel('频率 (Hz)');
23     ylabel('幅度');
24     title('DFS幅度谱');
```

Listing 4: 题 25 MATLAB 代码

Answer:

