Reading

- Chapter 7 in Oppenheim & Wilsky

Problems

- If a continuous-time co-sinusoidal signal with frequency $\pi 10000$ rads/sec is sampled at 3000 Hertz, what is the frequency of the resulting discrete-time co-sinusoid?
- 7.31
- 7.34 Besides specifying the L and M values draw sketches to show how the original spectra changes after each step in the upsampling-downsampling process. Assume that the original signal spectrum has a triangular shape.
- 7.35 *(Downsampling by a factor of 2)*
- *(Upsampling by a factor of 2)* Consider a discrete-time sequence $x[n]$ from which we form two new sequences $x_p[n]$ and $x_u[n]$. The sequence $x_p[n]$ corresponds to $x[n]$ with one zero sample inserted between each sample of $x[n]$. The sequence $x_u[n]$ is a low-pass filtered version of $x_p[n]$ using an ideal low-pass filter with cut off frequency of $\pi/8$.

$$x_p[n] = \begin{cases} x[n/2] & \text{if } n/2 \text{ is an integer} \\ 0 & \text{otherwise} \end{cases}$$

$$x_u[n] = h[n] * x_p[n]$$

1. If $x[n]$ is the sequence illustrated below, then sketch $x_p[n]$ and $x_u[n]$.
2. If $X(e^{j\omega})$ is as shown below, sketch $X_p(e^{j\omega})$ and $X_u(e^{j\omega})$.