Problem 13.1: Find the Fourier series coefficients of the following discrete-time signals. Use a straightedge to plot the magnitude and phase of the coefficients, and label all axes and important features. Show the origin for context.

(a) $x_a[n] = 2\cos\left(\frac{2\pi}{5}n\right)$

(b) $x_b[n] = \sin\left(\frac{2\pi}{5}n + \frac{\pi}{3}\right)$

(c) $x_c[n] = (-1)^n$ (Hint: This signal can be written as a complex exponential. What is its fundamental frequency?)

Problem 13.2: Find the Fourier series coefficients of $y[n] = 1 + \sin\left(\frac{2\pi}{5}n + \pi\right) + 2\sin\left(\frac{6\pi}{5}n\right)$. Use a straightedge to plot the magnitude and phase of the coefficients, and label all axes and important features. Show the origin for context.

Problem 13.3: Find the periodic discrete-time signal $g[n]$ whose fundamental period is $N = 6$, and whose non-zero Fourier series coefficients in the range $0 \le k < 6$ are

$$a_0 = 1, \quad a_1 = a_5^* = \frac{j3}{2}.$$

Use a straightedge to stem-plot $g[n]$ and label all axes and important features. Show the origin for context.

Problem 13.4: Consider the periodic discrete-time signal with period $N = 7$, defined over one period as

$$h[n] = 2\delta[n] - \delta[n-2], \quad -3 \le n < 4.$$

Find the Fourier series of the signal. Use your series to find the magnitude and phase of the first harmonic a_1.

Optional, but testable, problems: From the textbook, Problems 3.2, 3.9, 3.28