

1. (10 Pts Total) For each of the following two signals, determine the period and the Fourier series representation:

(a) (5 pts) $x_1[n] = 25 \cos\left(\frac{2\pi n}{5}\right) + 7 \cos\left(\frac{2\pi n}{15}\right)$

(b) (5 pts) $x_2[n] = \sum_{l=-\infty}^{\infty} \delta[n - 25l]$

2. (8 Pts Total) Consider a signal

$$x(t) = \frac{5 \sin(5\pi t)}{\pi t}.$$

- (a) (4 pts) Determine and plot the Fourier transform of $x(t)$.

- (b) (4 pts) The signal, $x(t)$, is passed through an LTI system with impulse response

$$h(t) = \frac{\sin(4\pi t)}{\pi t}.$$

Determine the system output $y(t) = (x * h)(t)$. [Hint: Solve this problem in the frequency domain and take the inverse Fourier transform to get $y(t)$.]

3. (2 Pts Total) Let

$$x(t) = \frac{5 \sin^2(5\pi t)}{\pi t^2}.$$

- (a) (1 pt) Is $X(j\omega)$ real, purely imaginary, or complex? Explain.

- (b) (1 pt) Is $X(j\omega)$ even, odd, or neither? Explain.