

Line Spectra Example

Example #1: Consider the signal

$$x(t) = 9 + 24 \cos(2\pi \cdot 440 \cdot t - \pi/4) + 14 \cos(2\pi \cdot 5000 \cdot t + \pi/8) + 8 \sin(2\pi \cdot 8000 \cdot t)$$

- Find the fundamental frequency, f_0 in Hz
- Sketch the two-sided amplitude and phase spectra (two plots)

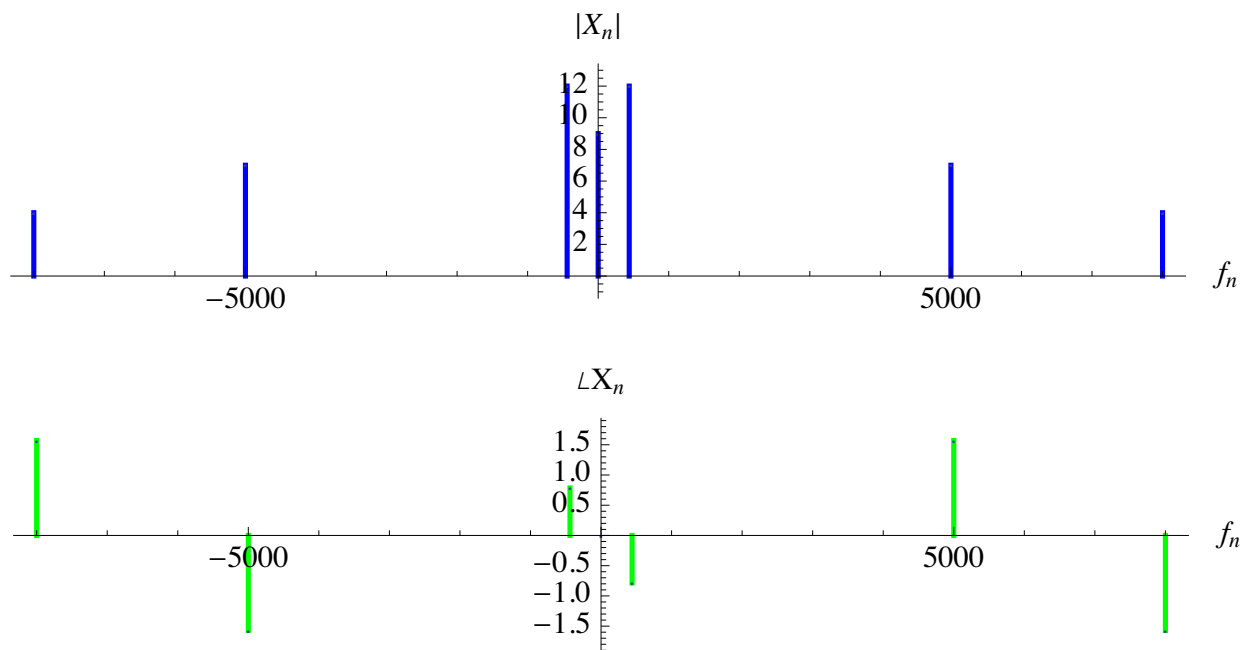
- To find the fundamental frequency recall that if it exists

$$f_0 = \text{GCD}(440, 5000, 8000) = 40\text{Hz}$$

- The magnitude and phase frequency spectra is based on the frequency pairs

$$(0, 9), (440, 12e^{-j\pi/4}), (-440, 12e^{j\pi/4}), (5000, 7e^{j\pi/8})$$

$$(-5000, 7e^{-j\pi/8}), (8000, 4e^{-j\pi/2}), (-8000, 4e^{j(\pi/2)})$$



Example #2: Consider the signal

$$x(t) = -8 + 10 \cos(2\pi \cdot 1000 \cdot t - \pi) \\ + 20 \sin(2\pi \cdot 2500 \cdot t + \pi/4)$$

- Find the fundamental frequency, f_0 in Hz
- Sketch the two-sided amplitude and phase spectra (two plots)

- To find the fundamental frequency recall that if it exists

$$f_0 = \text{GCD}(1000, 2500) = 500 \text{ Hz}$$

- The magnitude and phase frequency spectra is based on the frequency pairs

$$(0, 8e^{\pm j\pi}), (1000, 5e^{-j\pi}), (-1000, 5e^{j\pi}), \\ (2500, 10e^{-j\pi/4}), (-2500, 10e^{j\pi/4})$$

