



PROBLEM:

The “spectrum” diagram gives the frequency content of a signal.

- (a) Draw a sketch of the spectrum of $x(t)$ which is “cosine-times-sine”

$$x(t) = \cos(50\pi t) \sin(700\pi t)$$

Label the frequencies and complex amplitudes of each component.

- (b) Determine the minimum sampling rate that can be used to sample $x(t)$ without any aliasing.

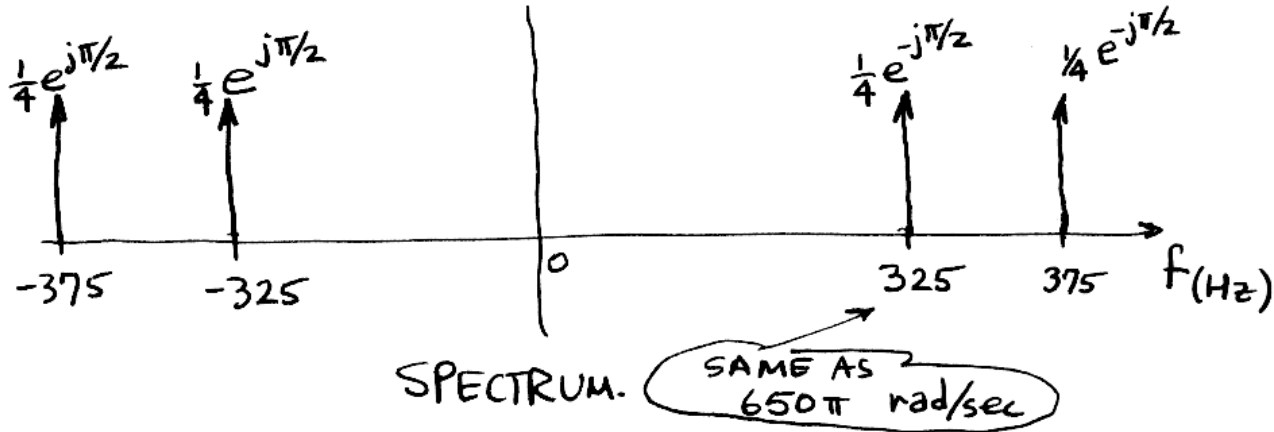


$$x(t) = \cos(50\pi t) \sin(700\pi t)$$

$$(a) \quad x(t) = \left(\frac{1}{2} e^{j50\pi t} + \frac{1}{2} e^{-j50\pi t} \right) \left(\frac{1}{2j} e^{j700\pi t} - \frac{1}{2j} e^{-j700\pi t} \right)$$

$$= \frac{1}{4j} e^{j750\pi t} + \frac{1}{4j} e^{j650\pi t} - \frac{1}{4j} e^{-j650\pi t} - \frac{1}{4j} e^{-j750\pi t}$$

\uparrow SAME AS $\frac{1}{4} e^{j\pi/2}$ \uparrow SAME AS $\frac{1}{4} e^{+j\pi/2}$



(b) Sampling Thm says sample at a rate greater than two times the highest freq.

$$\text{HIGHEST FREQ} = 375 \text{ Hz}$$

$$\Rightarrow f_s \geq 750 \text{ Hz.}$$