

PROBLEM:

An amplitude modulated (AM) cosine wave is represented by the formula

$$x(t) = [3 + \sin(\pi t)] \cos(13\pi t + \pi/2)$$

- (a) Use *phasors* to show that $x(t)$ can be expressed in the form:

$$x(t) = A_1 \cos(\omega_1 t + \phi_1) + A_2 \cos(\omega_2 t + \phi_2) + A_3 \cos(\omega_3 t + \phi_3)$$

where $\omega_1 < \omega_2 < \omega_3$; i.e., find A_1 , A_2 , A_3 , ϕ_1 , ϕ_2 , ϕ_3 , ω_1 , ω_2 , ω_3 in terms of A , ω_0 , and ω_c .

- (b) Sketch the two-sided spectrum of this signal on a frequency axis. Be sure to label important features of the plot. Label your plot in terms of the numerical values of the A_i 's ϕ_i 's and ω_i 's.
- (c) Determine the minimum sampling rate that can be used to sample $x(t)$ without any aliasing.