PROBLEM:

A signal $x(t)$ is given by the equation

$$x(t) = [A + \cos(40\pi t)]\cos(200\pi t - \pi/2).$$

The signal $x(t)$, which is given above as a *product*, can also be expressed as a *sum* of sinusoids of the form

$$x(t) = \sum_{k=1}^{N} D_k \cos(\omega_k t + \phi_k), \tag{1}$$

where the ω_k's are different freqeuncies.

(a) Determine the number of cosine terms in $x(t)$, i.e. the value of N in Equation (1).

$N =$ _____

(b) What are the lowest and highest frequencies of all the sinusoids in the sum form [Eq. (1)] of $x(t)$?

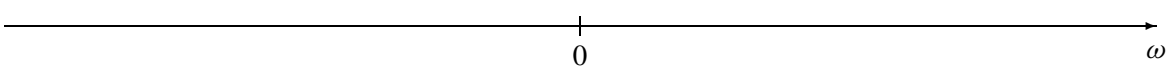
lowest $\omega_k =$ _____

highest $\omega_k =$ _____

(c) The spectrum of $x(t)$ contains a component at frequency 200π rad/sec with complex amplitude $-2j$. What is the numerical value of A?

$A =$_____

(d) Plot the two-sided spectrum of $x(t)$ on the graph below. Be sure to label all components of the spectrum with their frequency (in radians/sec) and their complex amplitude. You may need to use your result from part (c) to label the plot properly.



frequency in rad/sec