PROBLEM:

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

$$x(t) = [A + \sin(\omega_0 t)] \sin(\omega_c t)$$

where $0 < \omega_0 \ll \omega_c$.

(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 $A_1,\ A_2,\ A_3,\ \phi_1,\ \phi_2,\ \phi_3,\ \omega_1,\ \omega_2,\ \omega_3$ 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 unknown As and ωs.