PROBLEM:

A signal composed of sinusoids is given by the equation

$$x(t) = 4\cos(50\pi t - \pi/4) - 2\cos(150\pi t).$$

(a) Sketch the spectrum of this signal indicating the complex amplitude of each frequency component. You do not have to make separate plots for real/imaginary parts or magnitude/phase. Just indicate the complex amplitude value at the appropriate frequency.

(b) Is $x(t)$ periodic? If so, what is the period? Which harmonics are present?

(c) Now consider a new signal $y(t) = x(t) + 6\cos(60\pi t + \pi/3)$. How is the spectrum changed? Is $y(t)$ periodic? If so, what is the period of $y(t)$?

(d) Finally, consider another new signal $w(t) = x(t) + \cos(50t)$. How is the spectrum changed? Is $w(t)$ periodic? If so, what is the period of $w(t)$? If not, why not?