PROBLEM:

A signal composed of sinusoids is given by the equation

$$x(t) = 44\cos(3\pi t + \pi/6) + 55\cos(6\pi t) - 33\sin(12\pi t)$$

(a) Sketch the spectrum of this signal indicating the complex size 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 smallest period?

(c) Now consider a new signal $y(t) = x(t) + 11\cos(5\pi t - \pi/6)$. Draw a carefully labelled sketch of the spectrum for $y(t)$. Is $y(t)$ still periodic? If so, what is the period?

(d) Finally, consider another new signal $w(t) = x(t) + 22\cos(18t + \pi/6)$. Draw a carefully labelled sketch of the spectrum for $w(t)$. Is $w(t)$ still periodic? If so, what is the period?