PROBLEM:

Consider the signal

$$x(t) = [10\cos(3000\pi t - \pi/6)]^2.$$

(a) Express the signal $x(t)$ as a sum of complex exponential components. Do this by using the relationship $\cos\theta = \frac{e^{j\theta} + e^{-j\theta}}{2}$ to convert the cosine term into complex exponentials and then expand the squared expression.

(b) What frequencies (in Hz) are present in this signal?

(c) For each frequency identified in part (b), give the complex amplitude of the corresponding complex exponential component. Make a table of your analysis with frequency in one column and complex amplitude in a second column.

(d) Use your spectrum information to express $x(t)$ in the form $x(t) = A + B\cos(\omega_0 t + \phi)$.