EECS 212
S.P. 11.2

a) Consider the waveform:

$$v(t) = V_1 \cos(\omega_1 t + \theta_1) + V_2 \cos(\omega_2 t + \theta_2)$$

where $\omega_1 \neq \omega_2$ and V_1, V_2, θ_1, and θ_2 are arbitrary.

Prove that the rms value of this waveform is:

$$V_{rms} = \sqrt{\left(\frac{V_1}{\sqrt{2}}\right)^2 + \left(\frac{V_2}{\sqrt{2}}\right)^2} = \sqrt{\left(V_{1-rms}\right)^2 + \left(V_{2-rms}\right)^2}$$

Which is to say the rms value of a sum of two sinusoids is the square root of the sum of the squares of the rms values of the individual sinusoids. It can easily be shown this this relation holds true for the sum of any number of sinusoids with different frequencies.

b) Now, consider the waveform:

$$v(t) = 3\cos 100t + 4\cos(100t + 50°) + 5\sin 50t \quad [\text{V}]$$

Find the rms value of this waveform. (Hint: the answer is NOT 5 [V] !)