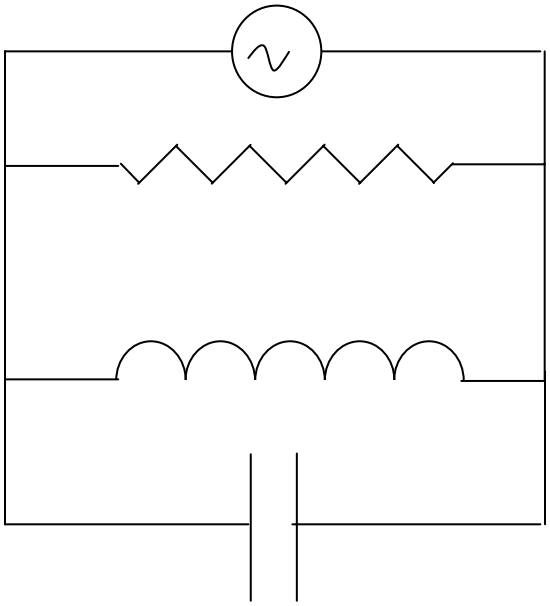
Homework 6:

Remember: In addition to this problem, you also have a "Mastering Physics" assignment Due March 7. Due at the **beginning** of lecture, Friday, March 7. Write up of the solution to this problem in a coherent fashion.

In class we have discussed a driven an RLC circuit in series: In this problem we will consider a parallel RLC circuit as in the diagram below:



In the figure the generator produces an EMF of $\mathcal{E} = \mathcal{E}_0 \cos(\omega t)$ and the resistance capacitance and inductance are given by R, C and L, respectively.

a) Use Kirchkoff's junction law to show that the current through the generator is given by: $I = \mathcal{E}_0 \left(\cos(\omega t)\frac{1}{R} + \sin(\omega t)\left(\frac{1}{\omega L} - C\omega \right) \right)$.

b) The current in a) can be written in the form $I = I_0 \cos(\omega t + \phi)$. Use standard trig identities to find I_0 and ϕ.

c) The average power dissipated is given by $P = I_{\text{RMS}}\, \mathcal{E}_{\text{RMS}} \cos(\phi)$. Calculate this explicitly and show that this result is independent of ω by $P = \frac{\mathcal{E}_{\text{RMS}}^2}{R}$. Explain on physical grounds why this had to be so.