Physics 4B: Problem Set 9 – Inductance and AC

1. Derive the inductance of a solenoid and rectangular toroid.

2. Find the energy stored in a toroid of N turns carrying a current I.

3. Derive the equations for  inductive and capacitive reactance and prove that Current and voltage are out of phase by ninety degrees (but different “ways”) in an inductor and capacitor.

4. Find the phase difference between the source voltage and current in a LR circuit and an RC circuit.

5. Derive the equation for the impedance, Z, of an LRC series circuit and find the one frequency where the current through the circuit is a maximum (the so called resonance frequency).