Physics 322 Homework Set #8 Winter 2009

Due in class Friday 2/13/09

1. Along solenoid with circular cross section has a radius, R, and N turns per unit length each carrying current I. Calculate the magnetic energy stored in a length, l, of the solenoid (near the center of the solenoid) by two methods:

a.) Using Equation 7.29 and the inductance you found in problem 7.22 of homework 7

b.) Using Equation 7.34

2. One type of transmission line consists of two parallel thin metal ribbons, each of width w, separated by a small gap, d, with $d << w$. Current I flows down one ribbon and back along the other ribbon. The current distributes itself uniformly across each ribbon.

a.) Calculate the capacitance per unit length, C/l, between the ribbons.

b.) Calculate the inductance per unit length, L/l, of the transmission line.

c.) Find the numerical value for $\sqrt{l^2/(LC)}$.

3. Problem 7.54 in your textbook.

5. Problem 8.2 in your textbook.

6. Problem 8.6 in your textbook.

6. Problem 8.9 in your textbook. For part (b), because $b >> a$, you can use our result for the magnetic field along the axis from a circular current loop.