Physics 200C, Problem Set 3, Due Fri. April 18, 2003, 5 p.m.

1. Jackson Problem 7.22.

2. For a rectangular air-filled waveguide with sides of 6 cm and 8 cm, in what modes can a 4GHz wave propagate?

3. For a rectangular air-filled copper (conductivity = 5 x 10^{17} \text{ sec}^{-1}) waveguide with one side twice the other (roughly the usual cross section), what are the minimum dimensions for a 10GHz wave to propagate in the standard lowest frequency TE mode?

4. For a common 75 ohm (characteristic impedance) coaxial cable with inner radius a=0.60 mm (the notation is that of problem 8.2) and polyethylene dielectric having \mu=\mu_0 and \varepsilon_e=K_e=\varepsilon_e/\varepsilon_0=2.25, find the outer radius in mm. (Use the equation given for characteristic impedance of the transmission line in Problem 8.2c)

Physics 200C, Problem Set 4, Due Fri. April 25, 2003, 5 p.m.

1. For a wave with frequency 10GHz, consider a rectangular air-filled copper waveguide with dimensions a=3cm and b=1.5cm. What is the fractional power loss per meter? Note that, for copper, \sigma=5.95\times10^7 \text{ (}\Omega\text{-m})^{-1}.

2. Jackson 8.3a.
   Note that he has chosen a particular linear polarization for the wave. Which? Why? In the last equation in the problem, you might conclude the \delta term lacks a factor of 2.

3. Jackson 8.5.

Physics 200C, Problem Set 5, Due Fri. May 2, 3003, 5 p.m.

   In part (b) use the following equation, which was given as eq. 8.99 in the 2nd edition of Jackson.
   \[ Q = \mu \frac{1}{\mu_c} \left( \frac{d}{\delta} \right) \frac{d}{R}, \quad \text{for circular cylindrical cavity.} \]
   Note that this equation follows from eq. 8.95 in the 3rd edition, plus the substitutions in the paragraph following eq. 8.95, plus the statement in the 2nd edition that \xi_L = 1 for all TM modes for a circular cylindrical cavity.

2. Jackson 9.1 bc (Skip method related to part a).