

**Problem Set 8**  
**Electrodynamics**  
**Winter, 2005**

**Due: March 4, 2005**

**Problem 1:** Jackson 3.17.

**Problem 2:** Jackson 3.20 (a) and (b). Plot the charge density on the lower plate as a function of  $r/z_0$  on one surface for a charge that is midway between the two plates and  $\frac{1}{4}$  the way from the lower plate to the upper plate. What is the charge density right below the charge?

**Problem 3:** Jackson 4.8

**Problem 4:** Jackson 4.10

**Problem 5:** Jackson 4.11

**Qualifying Exam Problems**

Do not use *Mathematica* to solve these problems!

Fall '02 – Problem 1

The charge density inside a sphere of radius  $R$  and dielectric constant  $\epsilon$  is given by

$$\rho(r) = \rho_0 \left(1 - \frac{r}{R}\right) \quad r < R$$

- (a) Calculate the electric field both inside and outside the sphere.
- (b) Calculate the electric potential both inside and outside the sphere.
- (c) Calculate the total potential energy of the charged sphere.

Spring '02 – Problem 1

A dielectric sphere (of radius  $R$ ) with dielectric constant  $\epsilon$  has an azimuthally symmetric charge density  $\sigma = \sigma_0 \cos \theta$  placed on its surface. Find the electrostatic potential everywhere inside and outside the sphere and the electric field inside the sphere. Outside the sphere is vacuum.