

Phys 3320 Electricity and Magnetism I
Fall 2018
Assignment 3

1. A hollow sphere has an inner radius of a and an outer radius of b . The inner surface has a charge with density $\sigma = \sigma_0$, whereas the outer surface has a charge with density $\sigma = \sigma_0 a^2/b^2$. There is no charge between the two surfaces. Find the electric field everywhere.
2. A thick-walled infinitely long cylinder has an inner radius of a and an outer radius of b . Between these two radii there is a charge density given by $\rho = \rho_0 (a/\pi)^2$. The outside surface also carries a surface charge $\sigma = \sigma_0$. Find the electric field at all points.
3. For the charge in the previous question find the potential difference between the inner and outer surfaces.
4. In class we derived the electric field at the surface of a metal, $E = \sigma/\epsilon_0$. Suppose now that we have a charge of density σ distributed over an infinitely large, infinitely thin membrane. Show that the field is now exactly half that, $\sigma/2\epsilon_0$.