

CLASSICAL ELECTRODYNAMICS I

Homework Set 8

April 12, 2013

1. A very long, right circular cylindrical shell of dielectric constant ϵ/ϵ_0 and inner and outer radii a and b , respectively, is placed in a previously uniform electric field $\mathbf{E}_0 = -E_0 \hat{x}$. The axis of the cylinder is along the z axis, and the medium inside and outside the cylindrical shell has a dielectric constant of unity.
 - (a) Find the potential everywhere, neglecting end effects.
 - (b) Use your results from part (a) to find the potential for the limiting case of a solid dielectric cylinder in a uniform field.
 - (c) Use your results from part (b) to find the potential for the limiting case of a solid conducting cylinder in a uniform field.
 - (d) Use your results from part (a) to find the potential for the limiting case of a cylindrical cavity in an infinite dielectric.