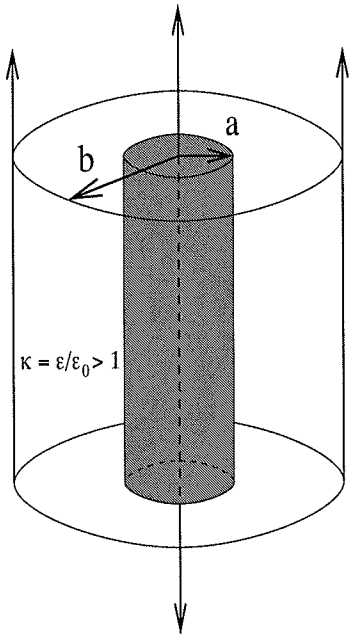
Wire / Cylinder

FALL 2010



1. A very long conducting wire of radius a, carrying free positive charge per unit length λ, is surrounded by a dielectric coating of outside radius b and relative dielectric constant $\kappa = \epsilon/\epsilon_0$.

   (a) {2 pts} Find the displacement vector $\mathbf{D}$ everywhere.

   (b) {2 pts} Find the electric field $\mathbf{E}$ everywhere.

   (c) {2 pts} Find the polarization density $\mathbf{P}$ everywhere.

   (d) {2 pts} Find the bound volume charge density ρ_b and the bound surface charge density σ_b everywhere.

   (e) {2 pts} Show that the total charge densities, bound and free, produce the same $\mathbf{E}$ found in (a).

* See Fall 2009, Problem 3 *