PHYS 703 - Dielectrics.

1.

(a) Consider a short squat cylinder of thickness d and radius $R \gg d$ made of insulator with dielectric constant ϵ and which carries a permanent polarization $\vec{P}$ parallel to the axis. What are $\vec{E}$, $\vec{P}$ and $\vec{D}$ on the axis both inside and outside (but close to) the cylinder? [Approximate answers will be sufficient; this is not intended to be a boundary value problem where you have to work out the fringe fields.]

(b) An infinitely long straight wire of radius R and at potential V_0 is embedded in an uncharged infinite dielectric whose permittivity depends linearly on distance from the axis of the wire:

$$\epsilon(\rho) = a\rho$$

Find the potential everywhere.