Solving Laplace’s Equation w/ Dielectrics I

A linear dielectric with permittivity $\epsilon$ is supporting a uniform electric field, $E_0 \hat{z}$. Suppose somewhere inside the linear dielectric there is a small spherical cavity. Find the electrostatic potential and electric field inside and outside the cavity as well as the bound charge on the cavity surface.

Solving Laplace’s Equation w/ Dielectrics II

An ideal electric dipole whose dipole moment is $p \hat{z}$ is placed at the center of a spherical cavity inside a linear dielectric with permittivity $\epsilon$. Calculate the electrostatic potential and electric field inside and outside the cavity as well as the bound charge on the cavity surface, assuming the only source of field is the dipole. Check that in the $\epsilon \to \infty$ limit the dielectric behaves like a conductor.

Linear Dielectrics

Griffiths, 4.18, 4.28, 4.38.