HW11 Due Mon Nov 22 at 7 p.m. in my mailbox or by email

Problem

Dielectric material with permittivity ϵ fills the whole space except for the spherical cavity with radius a. A pure dipole p is placed in the center of the cavity. Find the potential inside and outside the cavity.

Hint: assume that $\rho_b = -\vec{\nabla} \cdot \vec{P} = 0$. Solve the Laplace equation with necessary boundary conditions and then check that for the solution $\vec{\nabla} \cdot \vec{P} = 0$.