

Special Problem 5-3.8

A **dielectric sphere** with a **radius of 2m** is centered at the origin.

Surrounding this sphere is free-space.

Inside the dielectric sphere there exists an **electric flux density**:

$$\mathbf{D}(\bar{r}) = \frac{6}{r^2} \hat{\mathbf{a}}_r + \frac{2}{r \sin \theta} \hat{\mathbf{a}}_\phi \quad \text{C/m}^2$$

The dielectric sphere has an **electric susceptibility** of **3.0**.

Find:

1. The **relative** permittivity of the dielectric sphere.
2. The **electric field** within the dielectric sphere.
3. The **polarization vector** within the sphere.
4. The **volume** charge density of the **polarization** charge within the sphere.
5. The **surface** charge density of the **bound** charge on the surface of the sphere (a sphere with a radius of 2 m).