

Special Problem 3-4.3

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

This sphere is immersed in a **conducting** material, and **current** is flowing through this material, with a density:

$$\mathbf{J}(\bar{\mathbf{r}}) = \frac{1}{\rho \pi} \hat{\mathbf{a}}_{\rho} \quad \left[\frac{\text{A}}{\text{m}^2} \right]$$

At time $t=0$, there is **1 Coulomb** of charge **inside** the sphere.

How much **charge** is inside the sphere at time $t=2$ sec (i.e., **2 seconds** later)?