Homework 7

Physics 112A

Problem 4.12 Calculate the potential of a uniformly polarized sphere (Ex. 4.2) directly from Eq. 4.9.

Equation 4.9:

$$V(\vec{r}) = \frac{1}{4\pi\epsilon_0}\int_\nu \frac{\vec{P}(\vec{r'})\cdot\hat{r}}{r^2}d\tau'$$

$$\begin{aligned} V(\vec{r}) &= \frac{1}{4\pi\epsilon_0}\int_\nu \frac{\vec{P}(\vec{r'})\cdot\hat{r}}{r^2}d\tau' \\ &= \frac{2\pi P}{4\pi\epsilon_0}\int\int \frac{cos\theta}{r^2}r^2 sin\theta dr d\theta \end{aligned}$$