PROBLEM 1

UNIFORMLY CHARGED SPHERE

(a) $\boxed{\vec{E}(r) = \frac{1}{4\pi\varepsilon_0}\frac{Q}{r^2}\hat{r}}$ OK IF $\frac{1}{4\pi\varepsilon_0}\frac{\Theta}{r^2}$

(b)

$$Q_{ENCLOSED} = Q\frac{r^3}{a^3}$$

$$|E|\,4\pi r^2 = \frac{1}{\varepsilon_0}\frac{Qr^3}{a^3}$$

$$|E(r)| = \frac{1}{4\pi\varepsilon_0}\frac{Qr}{a^3}$$

$$\boxed{\vec{E}(r) = \frac{1}{4\pi\varepsilon_0}\frac{Qr}{a^3}\hat{r}}$$

PROBLEM 2

a) TOTAL CHARGE

$$\left(\frac{4\pi b^3}{3} - \frac{4\pi a^3}{3}\right)\rho = \frac{4\pi}{3}(b^3 - a^3)\rho$$

$$\vec{E}(r) = \frac{1}{4\pi\varepsilon_0} \frac{\frac{4\pi}{3}(b^3 - a^3)\rho}{r^2} \hat{r}$$

$$\boxed{\vec{E}(r) = \frac{1}{3\varepsilon_0} \frac{(b^3 - a^3)\rho}{r^2} \hat{r}}$$

b)

$$\frac{4\pi(r^3 - a^3)}{3}\rho = Q_{ENCLOSED}$$

$$\vec{E}(r) = \hat{r} \frac{1}{3\varepsilon_0} \frac{(r^3 - a^3)}{r^2} \rho$$

$$\boxed{\vec{E}(r) = \frac{1}{3\varepsilon_0} \frac{(r^3 - a^3)}{r^2} \hat{r}} \neq \frac{1}{3\varepsilon_0} \frac{(r^3 - a^3)}{r^2} \hat{r}$$

c) $\vec{E}(r) = 0$