PHY 1304 Fall 2008 Quiz #2 9-11-08 Name:

1) A charge of 6 microC is distributed uniformly thru a spherical volume having radius 5 cm. a) What is the E field at a radius of 2.5 cm? Explain your answer using Gauss's Law.

$$E = \frac{kQ}{R^3} r = \frac{(9\times10^9)\cdot(6\times10^{-6})}{(0.05)^3} \cdot (0.025) = 1.08\times10^7\ N/C$$

$$\oint \vec{E}\cdot d\vec{A} = \frac{q_{in}}{\varepsilon_0} \Rightarrow E\cdot 4\pi r^2 = \frac{Q\frac{r^3}{R^3}}{\varepsilon_0} \Rightarrow E = \frac{1}{4\pi\varepsilon_0}\frac{Qr}{R^3} \Rightarrow E = \frac{kQ}{R^3} r$$

According to the Gauss's Law, $\vec{E}$ depends on the charge inside the Gaussian surface. Thus $\vec{E}$ inside the solid sphere is proportional to the distance "r" from the center.

b) What is the E field at a radius of 6 cm?

$$E = \frac{kQ}{r^2} = \frac{(9.10^9)\times(6.10^{-6})}{(0.06)^2} = 1.5\times10^7\ N/C$$