Homework 3.

1) A conducting sphere with a uniform surface charge density $\rho_s = 10\mu C/m^2$ is placed at the origin of the rectangular coordinate system. Determine the electric field at points (0, 0, 10) m, (0, 5, 5) m and (3, 4, 5) m. Assume that the radius of the sphere is 1 cm.

2) A dielectric sphere with a uniform charge density $\rho_v = 10\mu C/m^3$ and dielectric constant $\varepsilon = 1.001\varepsilon_0$ is located at the origin of the rectangular coordinate system. Determine the electric field at points (5, 5, 5) m, (0, 0, 10) m and (2, 0, 0) cm. Assume that the radius of the sphere is 5 cm.

3) A dielectric cylinder of infinite length with dielectric constant $\varepsilon = 1.001\varepsilon_0$ contains a uniform charge density $\rho_v = 10\mu C/m^3$. The radius of the cylinder is 10 cm. Determine the electric field at the surface $\rho = 1m$ and $\rho = 5cm$.

4) A charge configuration in cylindrical coordinates is given by $\rho_v = 10e^{-2\rho}C/m^3$. Use Gauss's law to find the electric field $\bar{E}(\rho)$. Assume that the radius of the cylinder is 5cm.