SP 212 Worksheet
Lessons 6 & 7: Ch. 23.3-23.6, Applying Gauss’s Law

1) A solid sphere has radius $R$ and uniformly distributed charge $Q$. In terms of $R$ and $Q$, what is the volume charge density $\rho$ of the sphere? Find the electric field $\vec{E}$ at a distance $r$ from the center of the sphere for the cases (a) $r < R$, and (b) $r > R$.

For problems 2-4, consider a solid conducting sphere of radius $R = 0.500\, \text{m}$ and net charge $Q = 15.0\, \text{nC}$.

2) What is the $E$-field inside the sphere?

3) What is the surface charge density $\sigma$ at the surface of the sphere?

4) Using Gauss’s Law, find the $E$-field just outside the sphere.

5) Two square sheets of side length $L = 0.700\, \text{m}$ are parallel to the $x$-$y$ plane and are separated by a distance $d = 2.00\, \text{mm}$. The top sheet has a uniformly distributed charge $+9.00\, \text{nC}$ and the bottom sheet has a uniformly distributed charge $-9.00\, \text{nC}$. Far from their edges and close to their surfaces, find the $E$-field (a) below, (b) above, and (c) between the plates (treat them as plates with infinite extent).

6) A spherical shell has uniform volume charge density $\rho = 1.84\, \text{nC/m}^3$, inner radius $a = 10.0\, \text{cm}$, and outer radius $b = 2a$ (the inner sphere of radius $a$ is empty). What is the magnitude of the electric field at radial distances (a) $r = 0$, (b) $r = a/2$, (c) $r = a$, (d) $r = 1.5a$, (e) $r = b$, and (f) $r = 3b$ from its center?