PHYSICS 201
ASSIGNMENT 2

DUE: 09/25/17 (Monday)

READING
Chapter 6

PROBLEMS
33*, 44, 70, 77, and the following two extra problems:

(I) An uncharged square copper plate of negligible thickness and side length 50.0 cm is placed in a region of uniform electric field of 80.0 $\times 10^3$ N/C directed perpendicular to the faces of the plate (a side view is shown in the figure). Find (a) the charge density of each face of the plate and (b) the charge on each face.

(II) A solid, insulating sphere of radius $a$ has a uniform charge density throughout its volume and a total charge $Q$. Concentric with this sphere is an uncharged, conducting, hollow sphere whose inner and outer radii are $b$ and $c$ as shown in the figure. (a) Find the charge contained within a sphere of radius $r < a$. (b) From this expression, find the magnitude of the electric field for $r < a$. (c) What charge is contained within a sphere of radius $r$ when $a < r < b$? (d) From this expression, find the magnitude of the electric field for $r$ when $a < r < b$. (e) Now consider $r$ when $b < r < c$. What is the magnitude of the electric field for this range of values of $r$? (f) From this expression, what must be the charge on the inner surface of the hollow sphere? (g) From part (f), what must be the charge on the outer surface of the hollow sphere? (h) What are the surface charge densities at $r = b$ and $r = c$? (i) What is the magnitude of the electric field for $r > c$?

*For Problem 33, add the following part:
(b) Now suppose the 10 $\mu$C is located at the center of the cube. What is the flux though one face of the cube?
33  (b) $1.88 \times 10^5 \text{ N.m}^2/\text{C}$;

44.  (a) $5.40 \times 10^6 \text{ N/C}$; (b) $1.35 \times 10^7 \text{ N/C}$; (c) $6.75 \times 10^6 \text{ N/C}$; all directed towards the center of the sphere

70.  (a) $3.25 \times 10^{-10} \text{ C/m}^2$; (b) $7.07 \times 10^{-11} \text{ C/m}^2$; (c) $6.42 \times 10^{-12} \text{ C}$

(I)  (a) $\pm 7.08 \times 10^{-7} \text{ C/m}^2$; (b) $\pm 1.77 \times 10^{-7} \text{ C}$

(II)  (a) $Q(r/a)^3$; (b) $(1/4\pi\varepsilon_0)Qr/a^3$; (c) $Q$; (d) $(1/4\pi\varepsilon_0)Q/r^2$; (e) $0$; (f) $-Q$; (g) $+Q$; (h) $-Q/4\pi b^2$, $+Q/4\pi c^2$; (i) $(1/4\pi\varepsilon_0)Q/r^2$

NOTE: Please turn in your problem solutions at the beginning of class on the day they are due. You may just leave your solutions at the desk in the front of the room as you come in.