Print Names in Team: _____.

Physics 232	Mission 2: Gauss' Law & Electric Flux

Please work each problem in the white space provided. Attach additional sheets if necessary. Print this one-sided and staple in the top left corner with a metal staple once complete. Each team turns in one document.

Problem 7 A uniform charge Q is evenly distributed over a spherical shell with inner radius A and outer radius B. Find the magnitude of the electric field as function of the distance r from the center of the spherical shell.

Problem 8 Suppose $\vec{E}(x, y, z) = \langle y, 3x, z \rangle$ is the electric field due to some unknown distribution of charge. Find the flux of this field through the unit-sphere ($x^2 + y^2 + z^2 = 1$). What is the net-charge enclosed ? (recall I showed how to calculate flux in Week 1's lectures, you may omit units for this problem)

Problem 9 Suppose a charge Q_1 is uniformly distributed over a spherical region up to radius $r = A$. Then a charge Q_2 is uniformly distributed over $A \leq r \leq B$. Calculate the magnitude of the electric field as a function of the radius.

Problem 10 Suppose a flux of 3.0 Nm^2/C is measured to cross a cylinder of radius 5.0 cm and length $L = 30.0$ cm which encircles a long wire placed at the center of the cylinder. What is the charge per unit length in the wire?

Problem 11 Suppose a charge Q is placed at the origin. Find the flux through the region given by $-L \leq x \leq L$ at $z = L$ for $0 \leq y \leq L$.

Problem 12 Suppose we have two very large planes with charge density $\sigma_1 > 0$ at $z = z_1$ and a second with charge density $\sigma_2 = 2\sigma_1$ at $z = z_2$ where $z_1 < z_2$. Derive the electric field in each region via an appropriate application of Gauss' Law:

(a.) $z < z_1$

(b.) $z_1 < z < z_2$

(c.) $z > z_2$