Workshop 5

PHY142: Honors Introductory E&M

10-09-2013

"The enchanting charms of this sublime science reveal themselves in all their beauty only to those who have the courage to go deeply into it."
- Carl Friedrich Gauss, in a letter to Sophie Germain (1807)

Objective: More Gauss's law, review for midterm, question time...

Applications of Gauss's Law: For each problem, first draw a diagram. Indicate what type of symmetries you'll use.

1 Find the electric field outside a uniformly charges solid sphere of radius R and total charge q. (This problem should look familiar!) Notice that the field outside the sphere is exactly the same as it would have been if all the charge had been concentrated at the center (this makes for a good check).

2 A long cylinder (ask me to draw this on the board) carries a charge density that is proportional to the distance from the axis ($\rho = ks$, for some constant k). Find the electric field inside the cylinder.

3 An infinite plane carries a uniform surface charge σ. Find its electric field.