

Physics 513, Autumn Quarter 2017

Electrodynamics: Homework Assignment 3

Due October 19 either 11:00am in class or 10:45am in the instructor's mailbox.

1. Consider a cubical surface, centered on the origin, with side of length d .
 - a. What's the (Dirichlet) Green's Function inside the cube?
 - b. Outside the surface, there's an electrostatic field with the character of that produced by a point charge q at the origin: Find the surface charge producing this apparent point-charge exterior field.
2. A solid cylinder of length L and small radius R is positioned above and parallel to a grounded plane. The axis of the cylinder is a distance d from the plane. The cylinder carries a uniform charge density ρ .
 - a. Find the force on the cylinder.
 - b. Find the charge density on the plane.
3. A conducting sphere is completely within, but not necessarily concentric with, another conducting sphere. The radius of the inside sphere is r_i , the radius of the outer is r_o . The two spheres' centers are displaced a distance d . Find the capacitance between these two spheres.
4. Two parallel grounded conducting planes are separated by a distance d . A line charge with linear charge density λ between the plates is likewise parallel to the planes and located a distance z_0 above one of the planes. We could analyze this with, e.g., image charges. But instead use separation of variables in Laplace's Equation. You will need to deal in some way with the line charge.
5. A charge q is distributed over a finite volume, and that volume is completely contained within a sphere. Show that the average electrostatic potential over the sphere doesn't depend on how the charge is distributed over the finite volume.

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