

Physics 106: Electricity and Magnetism I
Spring Semester, 2010

PROBLEM SET 2: Due Monday, Feb. 22

Problem 1: Purcell 1-17 (hint: no integrals needed!!)

Problem 2: Purcell 1-20.

Problem 3: Positive charge is distributed uniformly throughout a long, non-conducting spherical shell of inner radius R and outer radius $2R$. At what radial depth beneath the outer surface of the charge distribution is the electric field strength equal to one-half the surface value?

Problem 4: Purcell 1.30.

Problem 5: Purcell 1.33.

Problem 6: Purcell 1.19.

Problem 7: Find the electric field inside a sphere which carries a charge density proportional to the distance from the origin (which is at its center) $\rho = \alpha r$, for some constant α . Note: this charge density is not uniform, and you must integrate to get the enclosed charge.

Problem 8: For practice, do the integral you didn't have to do in Problem 1-17 (b). To state it clearly: put a point charge q at the origin of a 3D Cartesian coordinate system, and calculate the flux through the square in the $x = b$ plane whose corners are at $(b, 0, 0)$, $(b, b, 0)$, $(b, 0, b)$, and (b, b, b) . This is a double integral of the form $\iint f(y, z) dydz$. Hint: think trig. substitutions! (If you are unsure how to do double integrals, don't hesitate to ask.)