

Problem Set 6
Electrodynamics
Winter, 2005

Problem 1: Jackson 3.1.

Problem 2: Jackson 3.14 (Hint: Think Green's functions for this problem).

Problem 3: A small uniformly charged cylinder with radius a and height $2a$ is placed at the origin with the cylinder's axis along the z-axis. Find the potential everywhere outside of a sphere of radius $2a$ as a series of Legendre polynomials.

Problem 4: The potential at the surface of an isolated sphere is held at $V(\theta, \phi) = V_0 \sin^3 \theta \cos \phi$. Find the potential everywhere outside the sphere if the potential at infinity is zero. Show that the lowest power in a $1/r$ expansion is equivalent to an electric dipole pointed along the x axis. What is the dipole moment?

Qualifying Exam Problems

Do not use *Mathematica* to solve these problems!

Fall '94 – Problem 3

The surface charge density of a thin spherical shell of radius R is axially symmetric and is given by $\sigma = \sigma_0 \cos \theta$. Find the electrostatic potential everywhere inside and outside the shell.

Spring, '93 – Problem 5

An electric dipole with dipole moment \vec{p} is placed at the center of a spherical cavity of radius R in a conductor. Find the electric potential everywhere inside the cavity. Find the surface charge density on the surface of the conductor.