Physics 7311 Professor Scalise
Homework Assignment #12 Due: 27 November 2002

30. A spherical surface of radius R has charge uniformly distributed over its surface with a density $Q/(4\pi R^2)$, eccept for a spherical cap at the north pole, defined by the cone $\theta = \alpha$.

    (a) Find the potential inside the sphere.

    (b) Find the potential outside the sphere.

    (c) Find the magnitude and direction of the electric field at the origin.

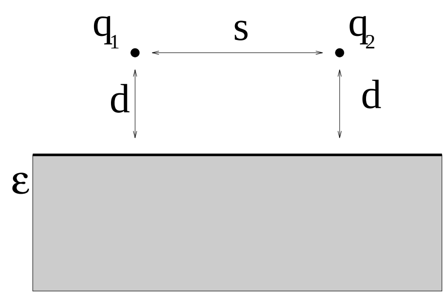
    (d) Discuss the limiting forms of the potential and the electric field as the spherical cap becomes

        i. very small

        ii. so large that the area with charge on it becomes a very small cap at the south pole

Here are more practice exam problems: **Warning!** This problem looks easy but is very subtle – be extremely careful in your solution. The whole point is to test your understanding of what contributes to the energy and what does not. I suggest explaining your reasoning in detail in case an algebraic error prevents you from obtaining the correct answer.

31. Two point charges q_1 and q_2, separated by a distance s, are each located a distance d from a semi-infinite slab of conductor that fills the entire lower half space. Calculate the energy of the system excluding the infinite self-energies of the point charges.



32. A grounded conducting sphere of radius a is placed in a uniform electric field of magnitude E_0. Put the origin of coordinates at the center of the sphere and the positive z-axis in the field direction. What is the potential outside the sphere?