Phys 3330 Electricity & Magnetism II
Spring 2019
Assignment #4 - due Friday February 22nd 2019

Laplace's Equation in two variables
Cylindrical coordinates

1. An infinitely long metal cylinder of radius R is split lengthwise into two semi-cylindrical pieces. The two halves are then reassembled to form a cylinder with small gaps running parallel to the z-axis, and through the points $x=\pm R$, $y=0$. The upper half ($y>0$) is held at a potential of $+V_o$, and the lower half at a potential $-V_o$. Find the potential at all points $r<R$.

2. An infinitely long cylinder of radius R has its axis aligned with the z axis, and is made from a material which has a dielectric constant ε_r. It is placed in a uniform electric field $\mathbf{E} = E_o\mathbf{i}$. Find the electric potential and electric field everywhere.

Laplace's Equation in two variables
Spherical coordinates

3. Review the problem we did in class of a metal sphere placed in a uniform electric field. Assume now that the sphere carries a net charge +Q before it is placed in the electric field.
   a. What change(s) do you need to make to the boundary conditions?
   b. What is the electrostatic potential outside of the sphere in this problem?