Electrodynamics: Homework Assignment 6.
Due November 8 either 11:00am in class or 10:45am in the instructor’s mailbox.

1. Variant of Jackson problem 3.9. A hollow right circular cylinder of radius $R$ has its axis coincident with the $z$-axis and its ends at $z=0$ and $z=L$. The electrostatic potential of the end faces is zero and the potential of the cylindrical surface is a constant $\Phi_0$. Find the electrostatic potential inside the cylinder. You will probably want to choose the periodic coordinate in the $z$-direction, meaning that separation constant has the opposite-from-usual sign, and the Bessel functions become Modified Bessel functions (Jackson equations 3.100-101). You might ponder the great simplification afforded by the extra condition that the electrostatic potential on the cylindrical surface is constant instead of being an arbitrary function of $\phi$ and $z$.

2. Consider a point charge $q$ at the origin. Find the electrostatic potential in cylindrical coordinates at a field point $(\rho, \phi, z)$.

3. Complete a simplified version of the example we did in class: Find the electrostatic potential inside a grounded cylinder of radius $R$ whose axis coincides with the $z$-axis and containing a point charge $q$ at the origin. You may find useful an identity from the normalization (Jackson equation 3.95) $\int_0^{\xi_0} [J_0(c\xi)]^2 \xi \, d\xi = \frac{\xi_0^2}{2} \left[ J_1(c\xi_0) \right]^2$. 

[ver 01Nov18 13:00]