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 Φ_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 ϕ and *z*.

2. Consider a point charge *q* at the origin. Find the electrostatic potential in cylindrical coordinates at a field point (ρ, ϕ, *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) $\int_0^{\xi_0}[J_0(c\xi)]^2\xi\, d\xi = \frac{\xi_0^2}{2}[J_1(c\xi_0)]^2$.

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