Physics 513, Autumn Quarter 2017
Electrodynamics: Homework Assignment 4
Due October 26 either 11:00am in class or 10:45am in the instructor's mailbox.

1. The potential from a circular ring of charge is evaluated in Jackson section 3.3. Now place this ring concentric with and completely within a grounded conducting sphere. Find the potential inside the sphere.

2. Consider a cone of half-angle θ_0. (θ_0 is the angle between the cone axis inside the cone and the cone surface). The cone surface has fixed potential $\Phi(r) = Ar^3$ with *A* a constant and *r* the distance from the cone apex. Find the potential inside the cone.

3. The tip of a conducting cone with the same geometry from problem 2 is placed so the tip is almost touching a grounded conducting plane. The cone axis is at right angles to the plane. The potential of the cone is fixed at Φ_0. Find the potential outside the cone. This is done in many places because this is the geometry of the "disk-cone" antenna, which has certain attractive features.

4. An infinitely-long cylinder of radius *R* has an infinitely-long section of azimuthal angle ϕ_0 removed. The resulting cylinder is raised to some potential and it's known the remaining cylinder carries constant linear charge density λ. What fraction of the charge is on the outer surface? This is done in many places and is sometimes called the "slotted-cylinder problem".

5. The cone from problem 2 is now a grounded conducting surface. A point charge *q* is inside the cone at coordinate (r_0, θ_0, ϕ_0) where θ=0 is the cone axis. Find the potential inside the cone.

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