

## Electrodynamics III: Assignment 3

Due April 24 at 11:00 am.

1. Scan your solutions as a single PDF file
2. Name your file **HW3-*lastname*.pdf**
3. Attach your file to an email...
4. ... with subject line **HW3-*lastname* ...**
5. ... and send the email to  
**ljrosenberg@phys.washington.edu**

1. Jackson problem 10.3. Scattering off a finite-conductivity sphere. Note that part *a* asks about the infinite-conductivity limit, which feeds into the class discussion of the normal component of the magnetic field.

2. Derive the leading factor of  $ik/2\pi$  (or  $-ik/2\pi$ ) in the Kirchhoff integral.

3. Find the on-axis intensity in the Fraunhofer (far) region due to plane waves normally incident on an opaque circular disk. This is a hard problem *ab initio*, but relatively easy using Babinet's principle. This demonstrates "Poisson's spot".

4. Figure *a*, below, shows a point source focused onto the focus point. In *a*, the field amplitude at the shown field point (the field point is not the focus point) is therefore zero. Figures *b* and *c* show complementary screens placed into the optical path. In both cases *b* and *c*, some diffracted waves arrive at the field point. Find the ratio of the intensity of the waves at the field point in figures *b* and *c*, and find the corresponding phase-shift of the waves between field points in figures *b* and *c*.

