# Homework 5

Due Friday 3/10/2014 - at beginning of class

## Griffiths' 4 Problems

**3.9** (Griffiths 3rd Edition 3.8)

**3.10** (Griffiths 3rd Edition 3.9)

**3.30** (Griffiths 3rd Edition 3.28)

## Additional Problems

**E.5.1** An infinite grounded conducting plane occupies the area $z < 0$. A dipole is formed of two charges $\pm Q$ separated by a distance $a$. The dipole moment is parallel to the $z$ axis. The center or the dipole is a distance $R$ from the plane. Compute the force on each charge and the total force on the dipole. Is the dipole attracted or repelled from the plane?

**E.5.2** A grounded conducting sphere of radius $a$ is centered at the origin. Two charges $+q$ are at a location $\pm D\hat{x}$ along the $x$-axis. Compute the electric potential at the point $2D\hat{x}$.

**E.5.3** The potential on the surface of an infinite cylinder is given by $V(a, \phi) = V_0(\sin(\phi) + \cos(\phi))$. Find the potential at all points inside the cylinder and the field inside the cylinder.

**E.5.4** Find the potential in the region where $x > 0$ and $y > 0$. The $y - z$ plane is held at potential $V_0$ and the $x - z$ plane is grounded. Hint, look at the trivial solutions.

**E.5.5** The potential of a rectangular system is independent of $z$. The system extends to infinity in the $x$ direction. On the plane $y = 0$ and $y = a$ the potential is zero. On the plane $x = 0$, the potential is $V(0, y) = V_0 \sin^2(\pi y/a)$. Compute the potential in the channel. Report the integral you would use to calculate the coefficients in the series, but you do not have to evaluate the integral.