Homework 1

Due Friday 1/25/2013 - at beginning of class

Reading Assignment - Chapter 1

Griffiths Problems, 4th Edition

Each problem should be started on its own piece of paper. Points will be removed from solutions that are difficult to read.

When the problem numbering is different between the 3rd and 4th edition of Griffiths, the third edition number is in parenthesis.

1.5 (Note, this is a nice time to try a symbolic math package).

1.11

1.13

1.15

1.18

1.25 (Griffiths 3rd Edition problem 1.24)

1.26 (Griffiths 3rd Edition problem 1.25)

Problem E.1.1 Calculate ∇V where $V = \vec{p} \cdot \vec{r}/r^3$ where $\vec{p}$ is a constant vector. Note this is the potential of a point dipole.
Problem E.1.2 Consider the vector field $\vec{E} = \gamma \hat{z} \times \vec{r}$ where γ is a constant. Sketch the field. Compute the line integral of the field around a circle of radius R in the $x - y$ plane by direct integration. Compute the same integral using Stoke's Thm.
Problem E.1.3 Consider the vector field $\vec{E} = \gamma \vec{r}$ where γ is a constant. Sketch the field. Compute the flux, $\oint \vec{E} \cdot d\vec{a}$, out of the cube $0 < x < 1$, $0 < y < 1$, and $0 < z < 1$ by direct integration. Compute the flux using the Divergence Thm.
Problem E.1.4 Consider the function $f = x^2 + y^2 + z^2$. Compute the gradient in both Cartesian and spherical coordinates. Show the answers agree.