

# Homework 1

Due Thursday 1/21/2010 - at beginning of class

Reading Assignment - Chapter 1

## Griffiths' Problems

1.5

1.6

1.11

1.13

1.15

1.18

1.24

1.25

**Problem E.1.1** Calculate  $\nabla V$  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  $\gamma$  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  $\gamma$  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.