Homework No. 02 (Fall 2013)

PHYS 320: Electricity and Magnetism I

Due date: Friday, 2013 Sep 13, 4.30pm

1. Laplacian:

   (a) Problem 1.26 in Griffiths 4th edition.

2. Integral calculus:

   (a) Problems 1.32 in Griffiths 4th edition.

   (b) Problems 1.33 in Griffiths 4th edition.

   (c) Problems 1.34 in Griffiths 4th edition.

3. Curvilinear coordinates:

   (a) Problems 1.38 in Griffiths 4th edition. (Hint: Use HW-01, prob 5)

   (b) Problems 1.39 in Griffiths 4th edition.

   (c) Problems 1.40 in Griffiths 4th edition.

   (d) Problems 1.62 (only part a) in Griffiths 4th edition.

   (e) Show that

   $$\frac{\partial}{\partial \phi}\hat{\boldsymbol{\phi}} = -\big[\sin\theta\,\hat{\mathbf{r}} + \cos\theta\,\hat{\boldsymbol{\theta}}\big], \tag{1}$$

   where (r,θ,ϕ) are spherical coordinates and $\hat{\mathbf{r}}$, $\hat{\boldsymbol{\theta}}$, and $\hat{\boldsymbol{\phi}}$ are the respective unit vectors in spherical coordinates. Sketch $\hat{\mathbf{r}}$, $\hat{\boldsymbol{\theta}}$, $\hat{\boldsymbol{\phi}}$, and $\partial\hat{\boldsymbol{\phi}}/\partial\phi$ to illustrate their relative directions.

4. Delta function:

   (a) Problems 1.44 in Griffiths 4th edition.

   (b) Problems 1.45 in Griffiths 4th edition.

   (c) Problems 1.47 in Griffiths 4th edition.

   (d) Problems 1.48 in Griffiths 4th edition.