THE STATE UNIVERSITY OF NEW JERSEY

RUTGERS

Department of Physics and Astronomy • 136 Frelinghuysen Road • Piscataway New Jersey 08855-0849
Telephone: (732) 445-4839 • Fax: (732) 445-4991 • e-mail: bart@physics.rutgers.edu

Physics 385, Fall 2007 Prof. Bartynski
Electromagnetism (I) **Due Fri. 7-Sept. 2007**

PROBLEM SET 1

Reading: Griffiths, Chapters 1.1 and 2.1.

1. Griffiths 1.3 (body diagonal is vector from one corner of cube, through center, to opposite corner)

2. Griffiths 1.5 (showing the equality for the *x*-components will suffice)

3. Griffiths 1.8(a)

4. During the course of the semester, we will encounter some rather nasty integrals. Some can be solved by relatively simple substitutions. Others will not be so straight forward. For those you have two choices. First, you could look the integral up in an integral table (either a book or on line). Alternatively, on the website, I have posted a link to "The Integrator" which is a very useful website from Wolfram where you can enter a function and it will return the (indefinite) integral. To familiarize you with this utility, go to the Integrator website and find the following integrals (which we are bound to encounter soon in our travels):

   (a) $\int \frac{x^3}{(a^2+x^2)^{3/2}} dx$

   (b) Using the substitution $u = x^2$, show that the integral $\int \frac{2ax}{(a^2+x^2)\sqrt{(a^2+2x^2)}} dx$ is the same as $\int \frac{a}{(a^2+u)\sqrt{(a^2+2u)}} du$.
   Verify that the Integrator gives equivalent results, given the substitution.

   (c) $\int \frac{x}{\sqrt{(a^2+x^2-\sqrt{2}ax)}} dx$

   (d) $\int \frac{\sin(x)}{\sqrt{[a^2+r^2-2ar\cos(x)]}} dx$

   Please print out the five results and attach them to your problem set.