Physics 106B: Electricity and Magnetism
Homework 7: Electrostatics – Laplace’s Equation, Multipole expansion

DUE: TUESDAY, MARCH 11 2003
NOTE: UNUSUAL DUE DATE FOR THIS HW. YOU MAY TURN IN UP TO 3 DAYS LATE
FOR 50Further extensions only with note from the Dean or health official.

Reading: Griffiths, Chapter 3

1. Griffiths 2.39
2. Griffiths 3.10
3. Griffiths 3.14
4. Griffiths 3.38
5. Show that for a point dipole

\[ \vec{E}(\vec{x}) = -\nabla V = \frac{3(\vec{p} \cdot \hat{r}) - \hat{r}}{4\pi \epsilon_0 r^3} \]  

(1)

6. Express the potential of a pointlike linear quadrupole, oriented parallel to the z axis, in Legendre polynomials. There are three charges: +q, −2q, and +q on the z axis, with −2q at the origin, and +q at z = −a and +a.