PHYS4210 Electromagnetic Theory Spring 2009

Posted Problem for Homework Due Thursday 29 Jan 2009

Make a plot of the electric potential and field for an electric dipole $\boldsymbol{p}$ in the "far field" region, that is, far away from the distance scale of the dipole. The electric potential is given in your textbook, Equation (2-6-7), namely

$$\phi(\boldsymbol{r}) = -\boldsymbol{p} \cdot \boldsymbol{\nabla} \left(\frac{1}{r} \right)$$

Choose $\boldsymbol{p} = p\hat{\boldsymbol{k}}$ and plot contours of the potential in the xz plane. Then draw field lines for the resulting electric field. (The result looks like Figure 2-10 in your textbook.)

You may sketch all this by hand if you like, but it is probably simplest (and neatest) if you used a computer program to make the plots. You have free access on campus to MATLAB, MAPLE, and also (to a limited extent) MATHEMATICA, so use whichever you prefer.