

Physics 425, Spring 2012:

Assignment set #9

Due March 7:

21. Griffiths 10.4

Due March 9:

22. From the class, we find the (approximate) potentials by an electric dipole \vec{p} as: $V(\vec{r},t) = \frac{1}{4\pi\epsilon_0 c} \frac{\hat{r} \cdot \dot{\vec{p}}}{r}$, $\vec{A}(\vec{r},t) = \frac{\mu_0}{4\pi} \frac{\dot{\vec{p}}}{r}$. Find the electric and magnetic fields in terms of \vec{p} and r . Note that these potentials are retarded potentials. [You might want to look up some vector analysis rules in Chapter 1.]

Due March 19:

Reading assignment: 11.1.3: prepare your own lecture on this section.

Student 1: set up the vector potential integral by a magnetic dipole at the origin

Student 2: conduct the integral to find the vector potential

Student 3: find electric and magnetic fields

Student 4: find and discuss the Poynting flux and the mean total radiation power.

Suggestion: note that you can use the spherical coordinates, but in integral, you should always keep the Cartesian components, by:

$$\vec{r} = r \sin \theta \cos \varphi \hat{x} + r \sin \theta \sin \varphi \hat{y} + r \cos \theta \hat{z}$$

$$d\vec{l}' = (-\sin \varphi' \hat{x} + \cos \varphi' \hat{y}) d\varphi'$$