TDEC 115 - Week 9 Recitation Problems

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May 31, 2006

New Formulas and Concepts

Last time we showed the effect of given magnetic fields on moving charges and currents. Now we will close the circle and discuss how the fields are themselves produced by moving charges and currents. Simple geometries can be readily integrated using the B-S Law, and we will be using these formulae primarily. The most important thing to remember is the right hand rule, as always.

Cross Product Rules

Remember the alphabetical order $i\ j\ k,\ i\ j$ and that you get a + going right and - going left. So $i \times j = k$ (going right), but $j \times i = -k$ (going left).

$$\begin{array}{c} \longrightarrow + \\ ijkij \\ - \longleftarrow \end{array}$$

Right Hand Rule

Where there are cross-products there is the right-hand-rule. We will use it extensively in these chapters. It is also very crutial for solving inductance problems. Please make sure you know it!

Biot-Savart Law

$$d\vec{B} = \frac{\mu_0}{4\pi} \frac{id\vec{s} \times \vec{r}}{r^3},$$

Remember, $id\vec{s}$ is a small bit of current, $\vec{r}$ points from the the current element *to* the point we want the field evaluated.

Ampère's Law

$$\oint \vec{B} \cdot d\vec{s} = \mu_o I_{enc},$$

This is a very powerful statement - the amount of magnetic field along an arbitary *closed* loop tells you how much current flows through the surface bounded by the loop. It is one of the fundamental equations of magnetics (the Biot-Savart Law can be derived from this - but it's very hard!).