PHYS 1444 - Lecture 8
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1 Magnetic Forces and Fields

Magnetic forces are similar to electric forces, except there are no magnetic charges. "Magnetic monopoles" are sort of like magnetic charges, but they might not exist.

Like poles repel, opposite poles attract. Magnetic poles create magnetic fields, and field lines move from "north" poles to "south" poles.

These forces and fields actually come from atoms themselves, which act as tiny magnets.

2 Magnetic Forces

Only moving charges are affected by magnetic forces. The velocity must have a component $\perp$ to the magnetic field.

$$\overrightarrow{F} = q\overrightarrow{v} \times \overrightarrow{B}$$

- F = Force felt by charge
- q = charge
- V = velocity of the charge
- B = Magnetic field

The units of a magnetic field are the Tesla: $1\ T = 1\ (N \cdot s)/(C \cdot m)$.
To find the cross product for F

$$|F| = |qv \times B| = |qv||B| \sin(\theta)$$

θ is the angle between the two vectors. But you still need to find the direction of the new vector. You can do this with the right hand rule. Pointer finger is v, middle finger is B.

3 Force on a Current

He derives this from an integral, which I won't put here

$$\overrightarrow{F} = I\overrightarrow{L} \times \overrightarrow{B}$$