St John Baptist De La Salle Catholic School, Addis Ababa
Homework 4
3rd Quarter

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March 13, 2023

Notes, and use of other aids is allowed. Read all directions carefully and write your answers in the space provided. To receive full credit, you must show all of your work. **Cheating or indications of cheating and similar answers will be punished accordingly**.

Information

- The homework is due on **Wednesday**, **March 15**.

- You should Work on it **in groups** and consult me if you have any questions. Cheating within groups is unacceptable.

- For purposes of neatness and simplicity of grading, you should do the homework on an **A-4 paper**.

Questions

1. What are ferromagnetic materials? What are some common ferromagnetic materials?

2. We have seen that charges and magnets have similar properties. How is a charge similar to and different from a magnet?

3. If a current carrying wire of 2A and length 3m is in a region of space that is perpendicular to a magnetic field of 3T, what is the maximum force on the wire? What about the minimum force?

4. An electron and a proton are shot with the same speed of $3 \times 10^7 m/s$ perpendicular to the magnetic field in question 3. What are the magnitudes of the forces on the electron and the proton? What about the radius of the trajectories by the electron and the proton?

5. A current carrying wire that is carrying a current of 4A is going into the page. What is the magnetic field strength due to the wire 2cm vertically above the wire?(Both B and $\hat{B}$)

6. For two wires both going out of the page, show that the two wires attract.

Advanced Problems

7. Using Ampere's Law, show that the magnetic field of a solenoid is given by $B = \mu_0 n I$ such that n is the number of turns in the solenoid per unit length.