Homework Unit Xb

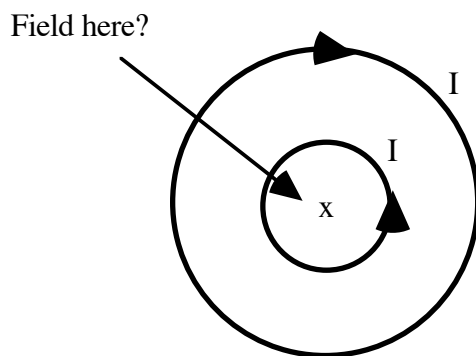**Session X.3**

1. A coaxial cable has an inner wire of diameter 0.2 mm, and an outer conducting cylinder with diameter of 2 mm. The inner wire carries a current of 0.1 A, and the outer cylinder the same current in the opposite direction. What is the magnetic field in between the inner wire and the outer cylinder, both in magnitude and direction?

2. Two long wires carry the same current of 5 A in opposite directions, spaced by 1 cm, as shown.
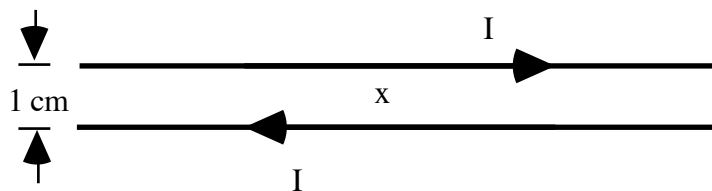
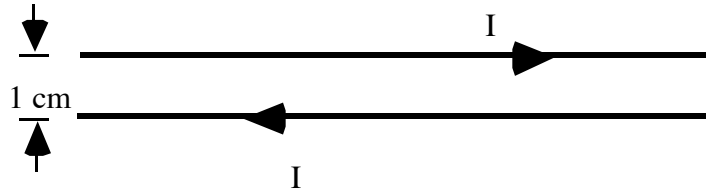What is the magnitude and direction of the field right between the two wires, at the location marked with the "x?"

3. Two concentric loops of wire or radius R_1 and R_2 each carry the same current, but in opposite directions. One might wonder if they cancel out each other's B field at the center. Do they? If not, what direction is the field and express the magnitude in terms of I and the two radii.

Session X.4

1. A charged particle moves parallel to a current carrying wire. The charge is positive, and it feels a magnetic force away from the wire. Is the charge moving in the same direction or opposite direction from the current in the wire? Explain.

2. The charged particle in question 1 has charge of 2 x 10^{-6} C and is moving at a speed of 5 x 10^5 m/sec at a constant distance of 1 cm from the wire. The wire carries 10 A of current. What is the magnitude of the magnetic force on the charge?

3. Two long wires carry the same current of 5 A in opposite directions, spaced by 1 cm, as shown.

What is the force exerted on a 10 cm length of one of the wires? Give both magnitude and direction.