Physics 200

Chapter 30   Sources of Magnetic Fields (Homework)

1. A wire carrying current, I, with length, a, lies on the x-axis with its left end at the origin. Calculate the magnetic field strength at the location (0, a).

2. Use Biot-Savart to calculate the strength of the magnetic field a distance, h, above the center of a circle of radius, r, which carries a current, I.

3. Use Biot-Savart to calculate the magnitude of the magnetic field at the center of a square loop of wire. The sides of the loop are "a" long and the wire carries a current, I.

4. Use Biot-Savart to calculate the strength of the magnetic field up an angle, ϕ, and a distance, a, from the end of a straight wire segment of length, L.

5. Calculate the magnetic field strength inside of an infinitely long solenoid.

6. What is the strength of the magnetic field a distance, a, from the center of a current carrying wire? The wire has radius, R, and current, I. (assume a < R)

7. An infinitely long cylinder of radius, a, has a cavity parallel to the axis of the cylinder. The cavity has a diameter, a, and the edge of the cavity passes through the center of the cylinder. Find the magnitude of the magnetic field at the point "P" which is a distance, 2 a, from the center of the cylinder and a distance, 2.5 a, from the center of the cavity. The wire has a current density, J.

8. A wire of radius, a, carries a current, I. A gap is cut in the wire. Calculate B in the gap a distance, r, from the center of the wire where (r < a).

9. A circular parallel plate capacitor's plates have radius, a, and a separation distance, x. The uncharged capacitor is connected to a battery, V, and a resistor, R. What is the magnetic field strength a distance, a/2, from the capacitor's center a time, t, later?

10. The voltage across a parallel plate capacitor is $V_0 \sin(\omega t)$. What is the displacement current as a function of time if the plate area is "A", the plate separation distance is "x".