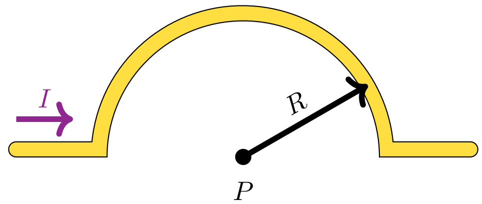
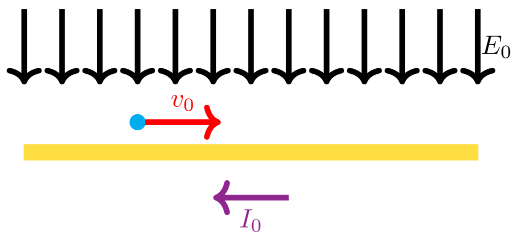
Chapter 28 - Sources of Magnetic Fields

Physics 207

1. Calculate the magnitude and direction of the magnetic field at point P due to the current in the semicircular section of wire.

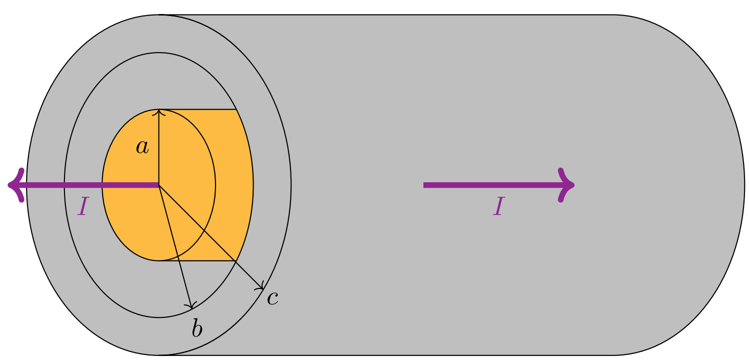


2. An electron is moving parallel to an infinitely long, current-carrying wire with some velocity v_0. There is a uniform electric field E_0 pointing downward as shown in the figure. Find the distance from the wire where the electron could pass through the electric field undeflected. Explain if this is a stable or unstable equilibrium. What would happen if the electron was replaced with a proton?



3. A wide, long insulating belt has a uniform positive charge per unit area σ on its upper surface. Rollers at each end move the belt to the right at a constant speed v. Calculate the magnitude and direction of the magnetic field produced by a moving belt at a point just above its surface. (Hint: At points near the surface and far from its edges or ends, the moving belt can be considered to an infinite current sheet.)

4. A solid conductor with radius a is on the axis of a conducting tube with inner radius b and outer radius c. The two conductors are isolated from each other. The central conductor and tube carry equal currents I in opposite directions. The currents are distributed uniformly over the cross sections of each conductor. Derive an expression for the magnitude of the magnetic field
a) Inside the central conductor ($r < a$)
b) At points outside the central, solid conductor but inside the tube ($a < r < b$)
c) At points inside the solid part of the tube ($b < r < c$)
d) Points outside the tube ($c < r$)



5. Two long, parallel transmission lines, d cm apart, carry I_1 and I_2 currents (assume $I_1 < I_2$). Find all locations where the net magnetic field of the two wires is zero if these currents are in (a) the same direction and (b) the opposite direction.