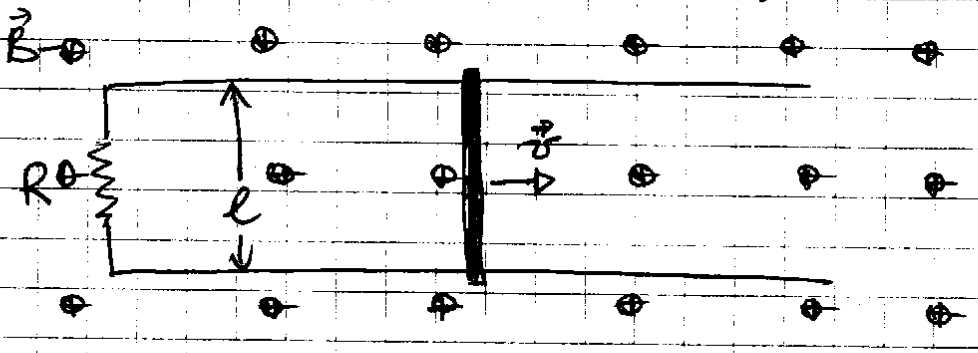
Problems Electrodynamics – I

(Due Mar 7, at 1pm)

(1) A metal bar of mass m slides frictionlessly on two parallel conducting rails a distance l apart. A resistor R is connected across the rails and a uniform magnetic field $\vec{B}$, pointing into the page, fills the entire region. (Griffith, Problem 7.7)

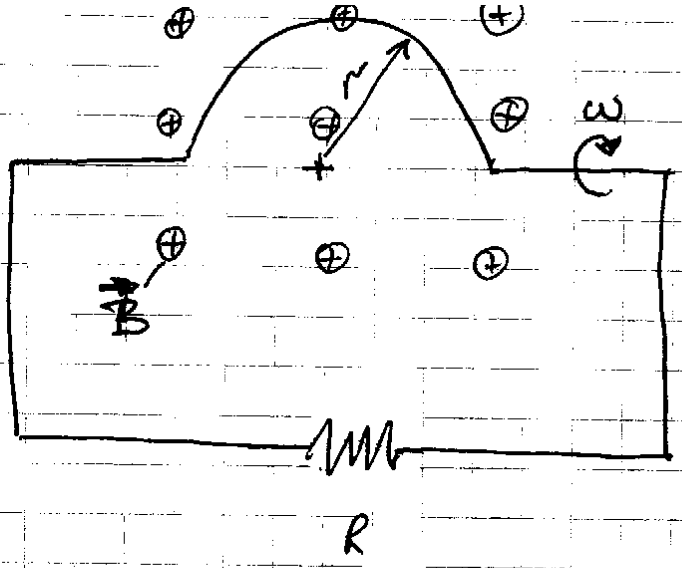


(a) If the bar moves to the right at speed v, what is the current in the resistor? (In what direction does it flow?

(b) What is the magnetic force on the bar? (In what direction?

(2) A semicircle of the radius r is mounted on a horizontal shaft and rotated at angular velocity ω. A uniform magnetic field B points into the page.

Determine frequency, amplitude and direction of the current in the circuit with the resistance R.



③ The current I flows in a circuit of radius a. Another identical loop is located at the distance d away from the first one. The axes of both loops are initially parallel. What is emf in the second loop, if it begins to rotate on a vertical axis with the angular velocity ω?