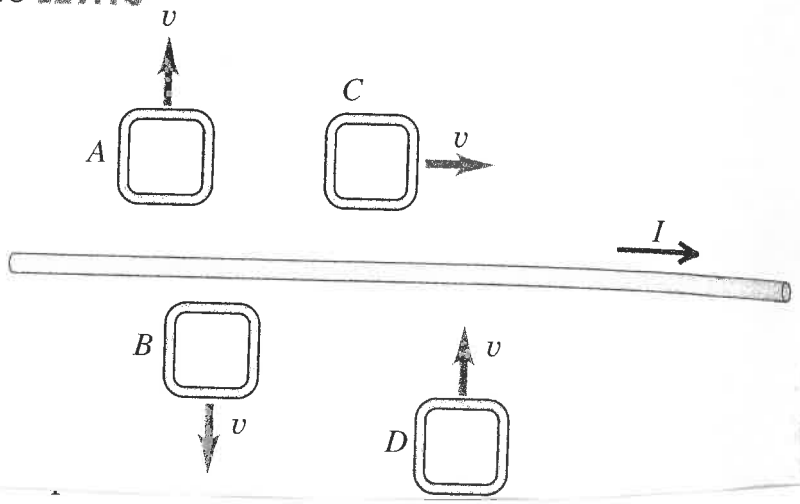
**28.20** • Two long, straight wires, one above the other, are separated by a distance $2a$ and are parallel to the $x$-axis. Let the $+y$-axis be in the plane of the wires in the direction from the lower wire to the upper wire. Each wire carries current $I$ in the $+x$-direction. What are the magnitude and direction of the net magnetic field of the two wires at a point in the plane of the wires (a) midway between them; (b) at a distance $a$ above the upper wire; (c) at a distance $a$ below the lower wire?

**29.16** • The current $I$ in a long, straight wire is constant and is directed toward the right as in **Fig. E29.16**. Conducting loops $A$, $B$, $C$, and $D$ are moving, in the directions shown, near the wire. (a) For each loop, is the direction of the induced current clockwise or counterclockwise, or is the induced current zero? (b) For each loop, what is the direction of the net force that the wire exerts on the loop? Give your reasoning for each answer.

Figure **E29.16**




**29.37** • The magnetic field within a long, straight solenoid with a circular cross section and radius $R$ is increasing at a rate of $dB/dt$. (a) What is the rate of change of flux through a circle with radius $r_1$ inside the solenoid, normal to the axis of the solenoid, and with center on the solenoid axis? (b) Find the magnitude of the induced electric field inside the solenoid, at a distance $r_1$ from its axis. Show the direction of this field in a diagram. (c) What is the magnitude of the induced electric field *outside* the solenoid, at a distance $r_2$ from the axis? (d) Graph the magnitude of the induced electric field as a function of the distance $r$ from the axis from $r = 0$ to $r = 2R$. (e) What is the magnitude of the induced emf in a circular turn of radius $R/2$ that has its center on the solenoid axis? (f) What is the magnitude of the induced emf if the radius in part (e) is $R$? (g) What is the induced emf if the radius in part (e) is $2R$?