P31.31 Name the currents as shown in the diagram:

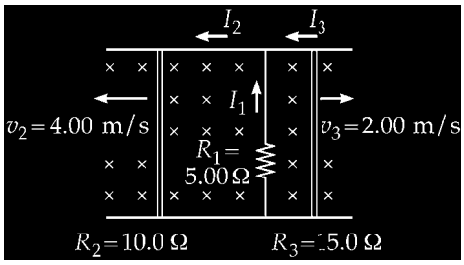

FIG. P31.31

Left loop:
$+Bdv_2 - I_2R_2 - I_1R_1 = 0$

Right loop:
$+Bdv_3 - I_3R_3 + I_1R_1 = 0$

At the junction: $I_2 = I_1 + I_3$

Then, $Bdv_2 - I_1R_2 - I_3R_2 - I_1R_1 = 0$

$$I_3 = \frac{Bdv_3}{R_3} + \frac{I_1R_1}{R_3}.$$

So, $$Bdv_2 - I_1(R_1 + R_2) - \frac{Bdv_3R_2}{R_3} - \frac{I_1R_1R_2}{R_3} = 0$$

$$I_1 = Bd\left(\frac{v_2R_3 - v_3R_2}{R_1R_2 + R_1R_3 + R_2R_3}\right) \text{ upward}$$

$$I_1 = (0.010\ 0\ \text{T})(0.100\ \text{m})\left[\frac{(4.00\ \text{m/s})(15.0\ \Omega) - (2.00\ \text{m/s})(10.0\ \Omega)}{(5.00\ \Omega)(10.0\ \Omega) + (5.00\ \Omega)(15.0\ \Omega) + (10.0\ \Omega)(15.0\ \Omega)}\right] = \boxed{145\ \mu\text{A}} \text{ upward.}$$

P31.41 (a) $\Phi_B = BA\cos\theta = BA\cos\omega t = (0.800\ \text{T})(0.010\ 0\ \text{m}^2)\cos 2\pi(60.0)t = \boxed{(8.00\ \text{mT}\cdot\text{m}^2)\cos(377t)}$

(b) $\varepsilon = -\frac{d\Phi_B}{dt} = \boxed{(3.02\ \text{V})\sin(377t)}$

(c) $I = \frac{\varepsilon}{R} = \boxed{(3.02\ \text{A})\sin(377t)}$

(d)

(e) so