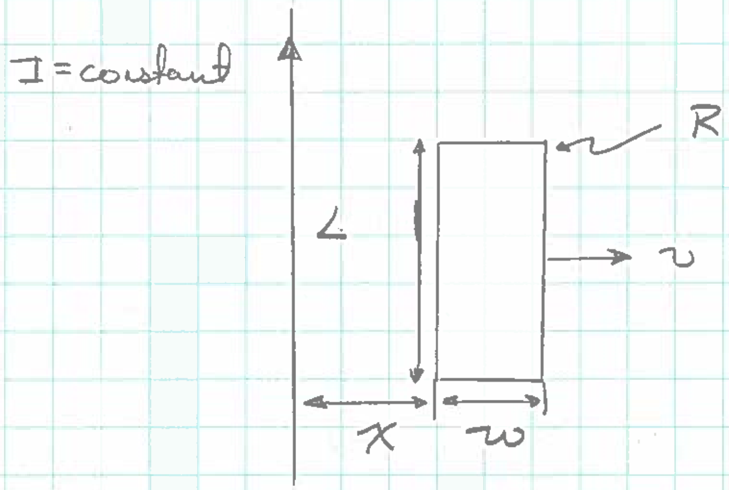

a.) find the induced current at this instant.

Faraday's law: $\mathcal{E} = \left|\frac{d\Phi_m}{dt}\right|$

where:

$\Phi_m = \int \vec{B}\cdot d\vec{A}$ as we did in WB 30-4:

$$\Phi_m = \frac{\mu_0 I L}{2\pi} \ln\left(\frac{x+w}{x}\right) = \frac{\mu_0 I L}{2\pi}\left\{\ln(x+w) - \ln x\right\}$$

Now:

$$\frac{d\Phi_m}{dt} = \frac{d\Phi_m}{dx}\frac{dx}{dt} = \frac{\mu_0 I L}{2\pi}\left\{\frac{1}{x+w} - \frac{1}{x}\right\} v$$

$$= \frac{\mu_0 I L}{2\pi}\left(\frac{-w}{x(x+w)}\right) v$$

or:

$$\frac{d\Phi_m}{dt} = \frac{\mu_0 I L}{2\pi}\frac{d}{dt}\left\{\ln(x+w) - \ln x\right\}$$

$$= \frac{\mu_0 I L}{2\pi}\left\{\frac{1}{x+w}\frac{dx}{dt} - \frac{1}{x}\frac{dx}{dt}\right\}$$

$$= \frac{\mu_0 I L}{2\pi}\left(\frac{-w}{x(x+w)}\right) v$$

So:

$$\mathcal{E} = \left|\frac{d\Phi_m}{dt}\right| = \frac{\mu_0 I L}{2\pi}\left(\frac{w}{x(x+w)}\right)v$$

and

$$I_{in} = \frac{\mathcal{E}}{R} = \frac{\mu_0 I L}{2\pi R}\left\{\frac{w}{x(x+w)}\right\}v$$

b.)

Also, since the flux is decreasing,

$\vec{B}_{in}$ reinforces $\vec{B}$ from wire

$\therefore$ I_{in} is CW.