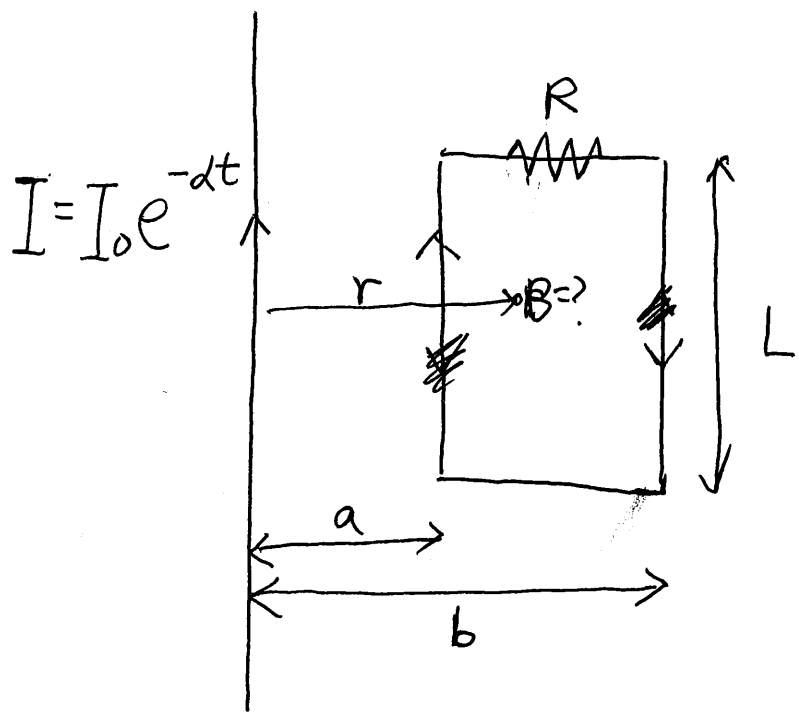
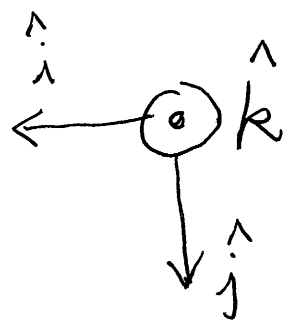
$$\mathcal{E} = -\frac{\partial \Phi_B}{\partial t}$$





$$\vec{B} = -\frac{\mu_0 I}{2\pi r}\hat{k}$$

$$\Phi_B = \int_a^b \left(-\frac{\mu_0 I}{2\pi r}\hat{k}\right)\left(L\,dr\,\hat{k}\right)$$

$$= -\frac{\mu_0 I L}{2\pi}\ln\frac{b}{a}.$$

$$\Phi_B(t) = -\left(\frac{\mu_0 L}{2\pi}\ln\frac{b}{a}\right) I_0 e^{-\alpha t}$$

$$\mathcal{E} = -\frac{\partial \Phi_B}{\partial t}$$

$$= -\frac{\partial}{\partial t}\left[-\frac{\mu_0 L}{2\pi}\ln\frac{b}{a}\right] I_0 e^{-\alpha t}$$

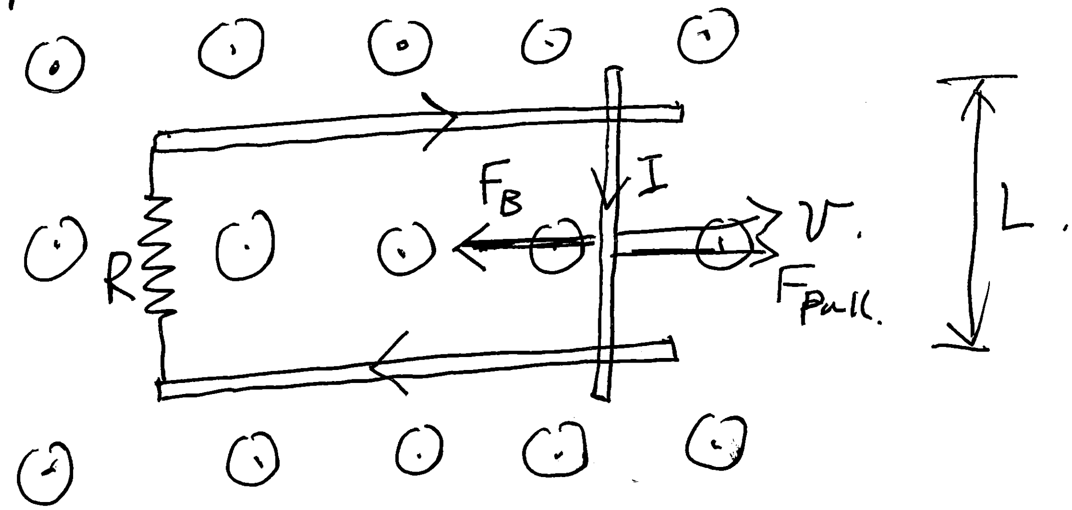
$$= \frac{\mu_0 L}{2\pi}\left(\ln\frac{b}{a}\right) I_0 \frac{\partial}{\partial t} e^{-\alpha t}.$$

$$= -\left(\frac{\mu_0 L I_0 \alpha}{2\pi}\ln\frac{b}{a}\right) e^{-\alpha t}$$

$$I = \frac{\mathcal{E}}{R} = -\frac{\mu_0 L I_0 \alpha}{2\pi R}\ln\frac{b}{a}\, e^{-\alpha t}.$$

Current is flowing clockwise
(opposite to $\hat{k}$)

$\vec{B}$ (constant)



$$|\vec{F}_B| = ILB\sin 90^\circ = ILB$$

$$|\vec{F}_{pull}| = ILB$$

Work done by F_{pull} = Energy dissipated in R.

$$ILBv = I^2R$$

$$\Rightarrow \cancel{I} \; IR = LBv$$

$$\therefore \; \mathcal{E} = LBv$$

← Motion Emf.