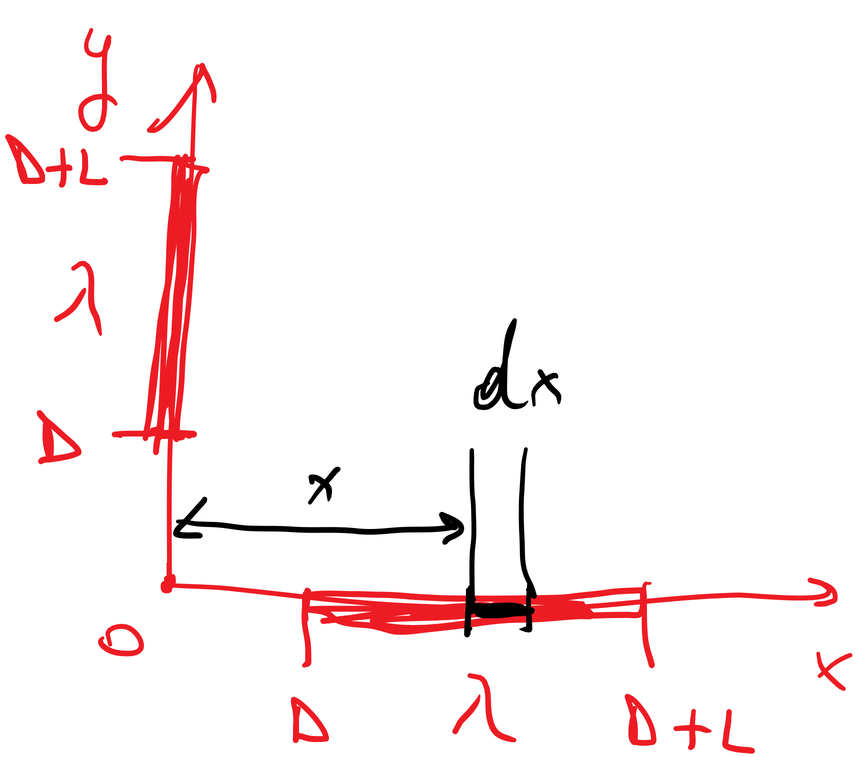
23-01-2023

P.1

1)



$$dq = \lambda\, dl = \begin{cases} \lambda dx \\ \lambda dy \end{cases}$$

$$V(0) = V_x(0) + V_y(0)$$

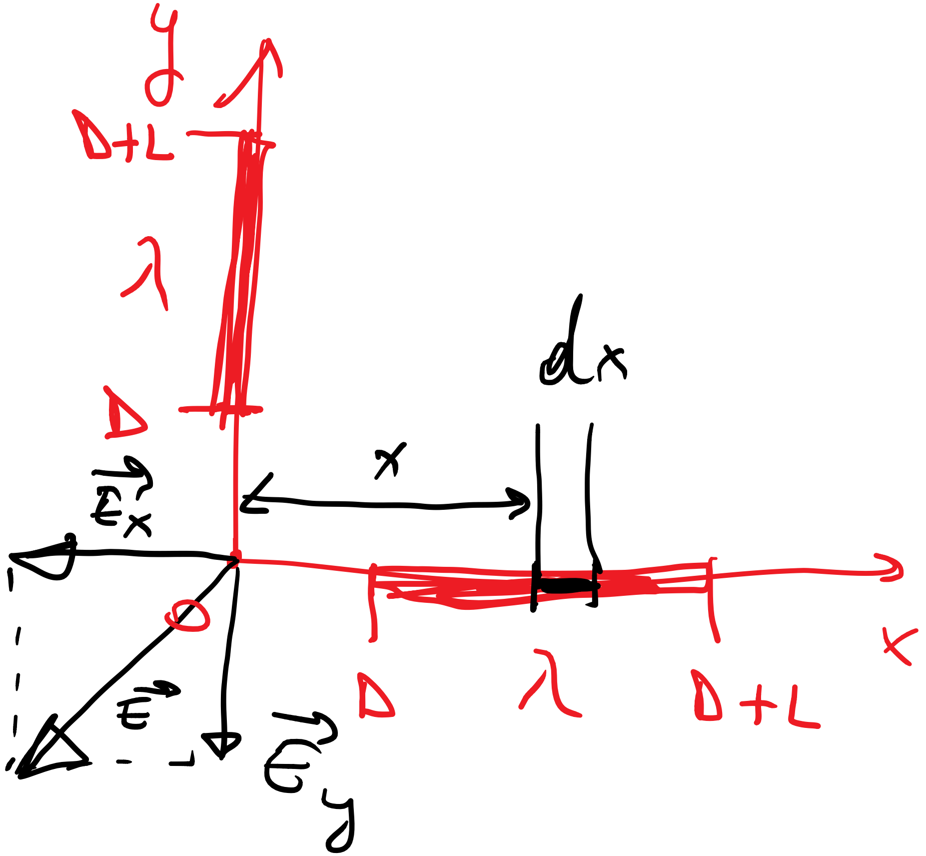
$$V_x(0) = \frac{dq}{4\pi\varepsilon x} = \frac{\lambda}{4\pi\varepsilon}\frac{dx}{x}$$

$$V_x(0) = \frac{\lambda}{4\pi\varepsilon}\ln\left(\frac{D+L}{D}\right)$$

$$V_y(0) = \frac{\lambda}{4\pi\varepsilon_0}\frac{dy}{y} = \frac{\lambda}{4\pi\varepsilon_0}\ln\left(\frac{D+L}{D}\right)$$

$$V(0) = \frac{\lambda}{4\pi\varepsilon_0}\left[2\ln\left(\frac{D+L}{D}\right)\right]$$

$\boxed{P.2}$



$$dq = \lambda\, dl = \begin{cases} \lambda\, dx \\ \lambda\, dy \end{cases}$$

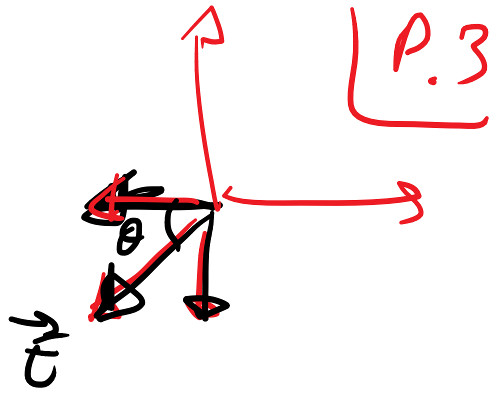
$$\vec{E}(0) = \vec{E}_x(0) + \vec{E}_y(0)$$

$$\vec{E}_x(0) = -\hat{x} \int_D^{D+L} \frac{\lambda \quad dx}{4\pi\varepsilon_0 (x^2)} =$$

$$= -\hat{x} \frac{\lambda}{4\pi\varepsilon_0} \left[-\frac{1}{x} \right]\Big|_D^{D+L} =$$

$$= -\hat{x} \frac{\lambda}{4\pi\varepsilon_0} \left[-\frac{1}{D+L} + \frac{1}{D} \right] = -\hat{x} \frac{\lambda}{4\pi\varepsilon_0} \left[\frac{-\cancel{D} + \cancel{D} + L}{D(D+L)} \right] = \frac{-\hat{x}\lambda L}{4\pi\varepsilon_0 D(D+L)}$$

$$\vec{E}_y = -\hat{y}\,|\vec{E}_y| \qquad |\vec{E}_y| = |\vec{E}_x|$$



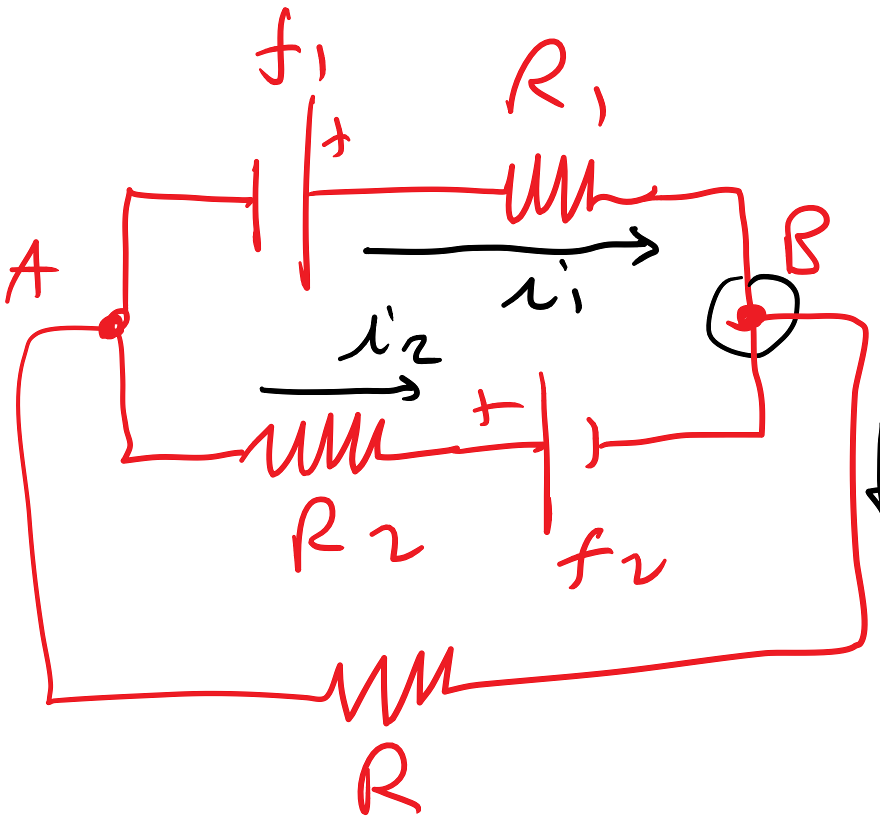
$$\vec{E}_y = -\hat{y}\,\frac{\lambda L}{4\pi\varepsilon_0 D(D+L)}$$

$$\vec{E} = -\hat{x}\,\frac{\lambda L}{4\pi\varepsilon D(D+L)} - \hat{y}\,\frac{\lambda L}{4\pi\varepsilon(D+L)D}$$

$$|\vec{E}| = \sqrt{2\left[\frac{\lambda L}{4\pi\varepsilon_0 D(D+L)}\right]^2} = \frac{\lambda L\sqrt{2}}{4\pi\varepsilon_0 D(D+L)}$$

$$\theta = \operatorname{arctg}\frac{E_y}{E_x} = \operatorname{arctg} 1 = 45^\circ$$

2)



P.G

AL NODO B

$$i'_1 + i'_2 \mp i'_R = 0$$

$$\Downarrow$$

$$i'_1 = -i'_2$$

$$\Downarrow \boxed{i'_R = 0}$$

PER AVERE $i'_R = 0$

DEVE ESSERE

$$\Delta V_R = \Delta V_{AB} = V_A - V_B = R i'_R = 0$$

$$V_A = V_B$$

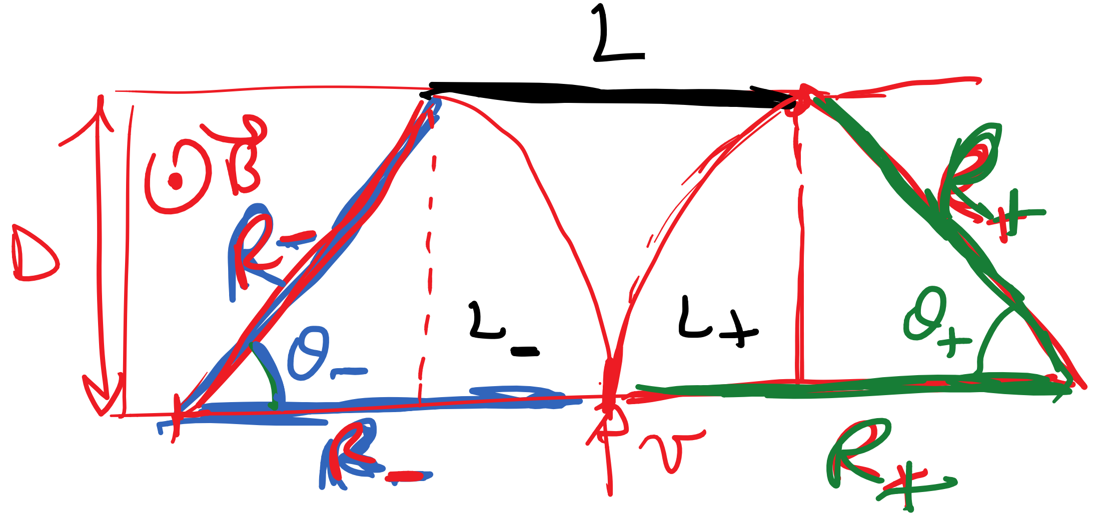
$$\begin{cases} \text{eq 1: } V_A - V_B = -f_1 + R_1 i'_1 = 0 \rightarrow f_1 = R_1 i'_1 \rightarrow i'_1 = \dfrac{f_1}{R_1} \\ \text{eq 2: } V_A - V_B = +f_2 + R_2 i'_2 = 0 \rightarrow f_2 = -R_2 i'_2 = R_2 i'_1 \end{cases}$$

e $i_2 = -i_1$

$$\Downarrow R_2 = f_2 / i'_1$$

$$R_2 = \frac{f_2}{f_1} R_1$$

3)



P.5

$$\vec{F} = q\vec{v} \times \vec{B}$$

$$F = qvB = m a_c = m\frac{v^2}{R}$$

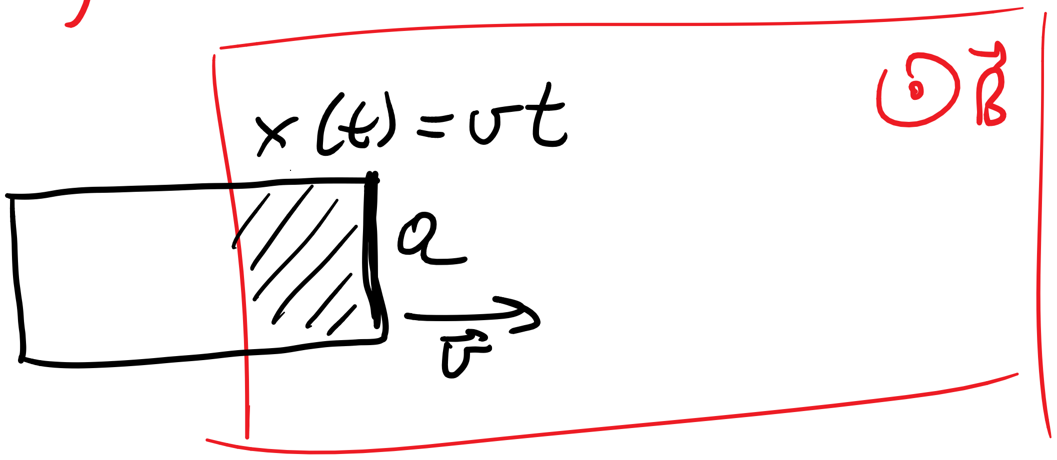
$$R = \frac{mv}{qB}$$

$$R_+ = \frac{m_+ v}{q_+ B} = \frac{M_2 v}{Q_2 B} \qquad L_+ = R_+ - \sqrt{R_+^2 - D^2} = \begin{cases} R_+ - R_+\cos\theta_+ \\ \theta_+ = \arcsin\frac{D}{R_+} \end{cases}$$

$$R_- = \frac{m_- v}{q_- B} = \frac{M_1 v}{Q_1 B} \qquad L_- = R_- - \sqrt{R_-^2 - D^2} = \begin{cases} R_- - R_-\cos\theta_- \\ \theta_- = \arcsin\frac{D}{R_-} \end{cases}$$

$$L_{MIN} = L_+ + L_- = R_+ + R_- - \sqrt{R_+^2 - D^2} - \sqrt{R_-^2 - D^2}$$

4)



$\phi(\vec{B}) = B(t)\,a v t$

$B(t) = kt \rightarrow \phi(\vec{B}) = akvt^2$

$-\frac{d}{dt}\phi(\vec{B}) = -2akvt = f_{em}(t)$

$\frac{f_{em}(t)}{R} = i(t)$ $\qquad \cancel{f_{em}}\ f_{em}(t^*) = Ri^* = -2akvt^*$

$R = -\frac{2akvt^*}{i^*}$

OVVIAMENTE i^* SARÀ IN SENSO ORARIO