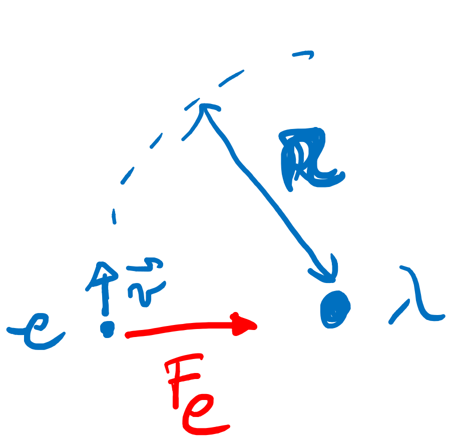
1)



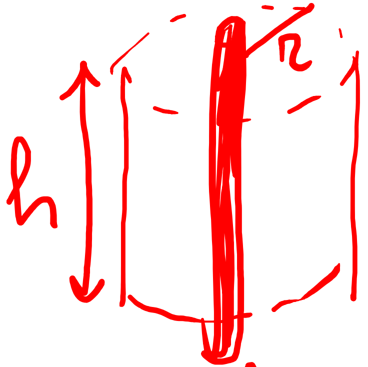
la Forza elettrica è attrattiva per cui il segno di λ è $+$ $(\lambda > 0)$

$$F_e = m_e a_c = m_e \frac{v^2}{r} \qquad a_c = \text{acc. centripeta}$$

$$\| $$

$$|-e| E \rightarrow eE = m_e \frac{v^2}{r}$$

E = campo prodotto da filo carico: uso GAUSS



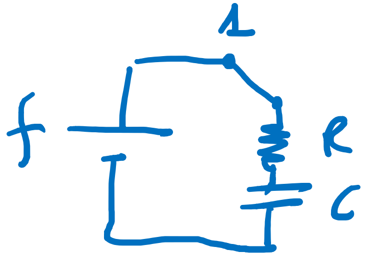
$$\phi(\vec E) = E(r)\, 2\pi r \cancel{h} = \frac{q}{\varepsilon_0} = \frac{\lambda \cancel{h}}{\varepsilon_0}$$

da cui $E(r) = \frac{\lambda}{2\pi \varepsilon_0 r}$

$$eE = m_e \frac{v^2}{r} \rightarrow e \frac{\lambda}{2\pi \varepsilon_0 \cancel{r}} = m_e \frac{v^2}{\cancel{r}} \rightarrow \lambda = 2\pi \varepsilon_0 m_e v^2 / e$$

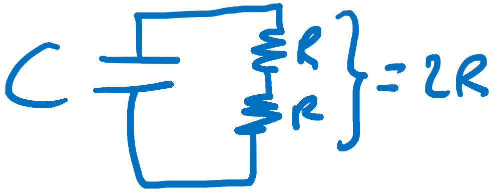
STATO 1 : CONDENSATORE CARICO $V_{C\,in} = f$

2)



$$U_C = \frac{1}{2} C f^2 = U_R \rightarrow C = \frac{2U_R}{f^2}$$

STATO 2



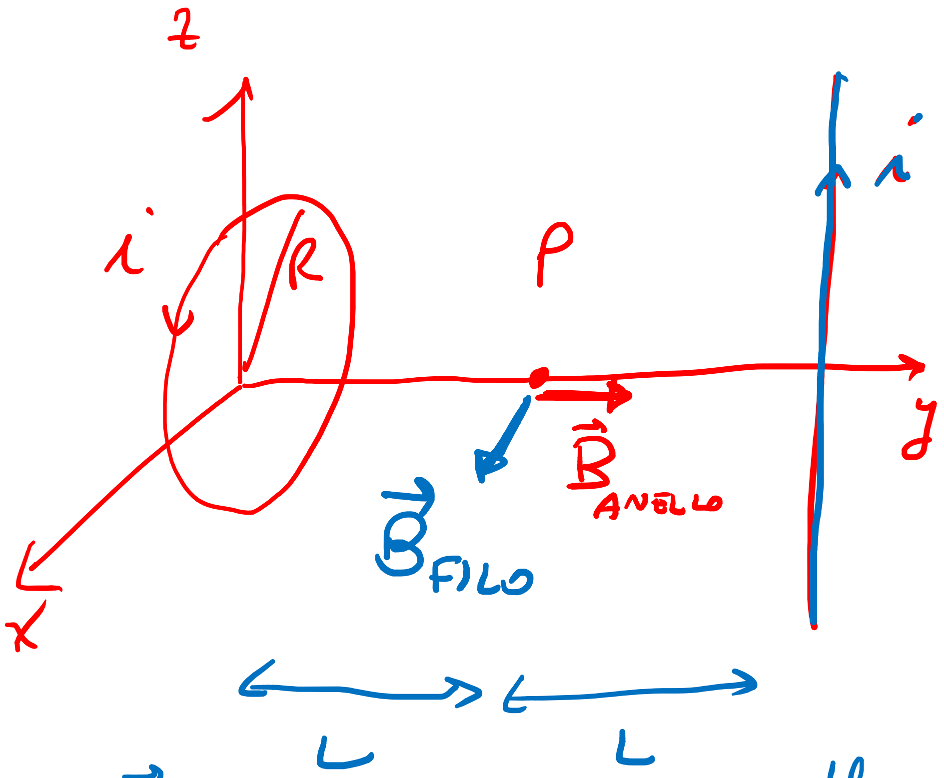
$$\tau = 2RC \rightarrow \tau = 2R \cdot \frac{2U_R}{f^2} = \frac{4RU_R}{f^2}$$

$$Q_{MAX} = Cf \qquad \frac{1}{3} Cf = Q(t^*) = Cf\, e^{-t^*/\tau} \rightarrow \frac{1}{3} = e^{-\frac{t^*}{\tau}}$$

$$\ln\left(\frac{1}{3}\right) = \ln e^{-\frac{t^*}{\tau}} \rightarrow \ln 3^{-1} = -\ln 3 = -\frac{t^*}{\tau} \rightarrow t^* = \tau \ln 3$$

$$t^* = \frac{4RU_R}{f^2} \ln 3$$

3)



$$\vec{B}(\vec{P}) = \hat{x}\, B_{FILO} + \hat{y}\, B_{ANELLO}$$

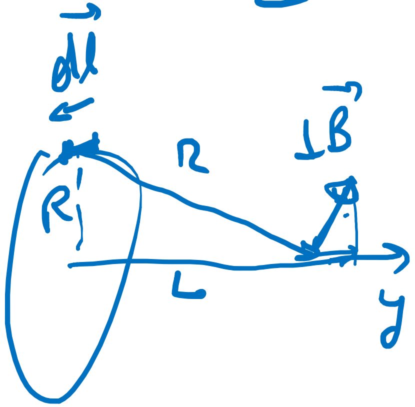
$$B_{FILO} = \frac{\mu_0 i}{2\pi L}$$

$$B_{ANELLO} = \frac{\mu_0 i R^2}{2(R^2+L^2)^{3/2}}$$

$$|\vec{B}| = \sqrt{B_{FILO}^2 + B_{ANELLO}^2}$$

$$|\vec{B}| = \sqrt{\left(\frac{\mu_0 i}{2\pi L}\right)^2 + \left(\frac{\mu_0 i R^2}{2}\right)^2 \frac{1}{(R^2+L^2)^3}}$$

$$B = \frac{\mu_0 i}{2}\sqrt{\left(\frac{1}{\pi L}\right)^2 + \frac{R^4}{(R^2+L^2)^3}}$$

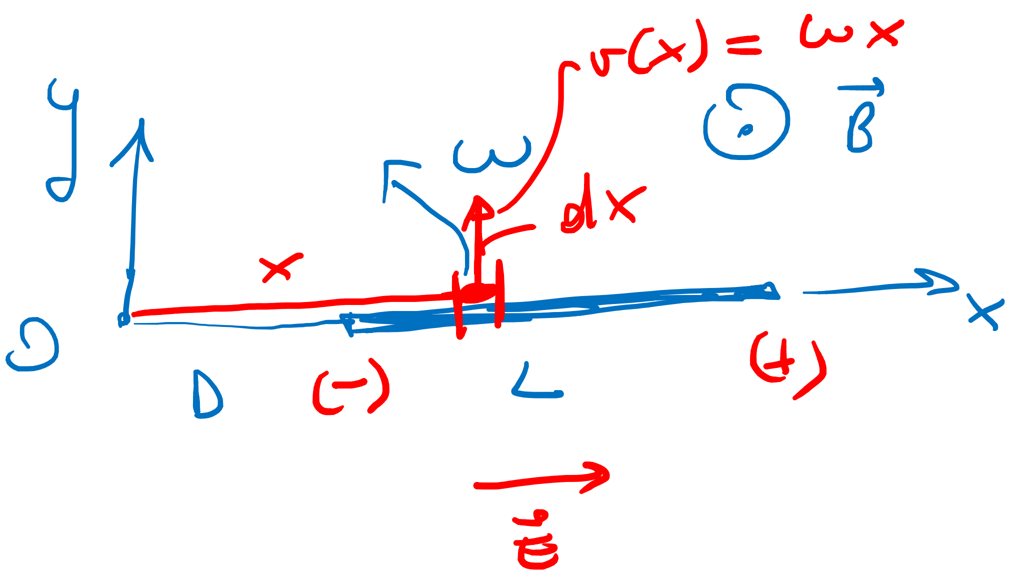


$$dB = \frac{\mu_0 i}{4\pi}\frac{\overbrace{R\,d\theta}^{dl}}{(R^2+L^2)}$$

$$dB_y = \frac{\mu_0 i}{4\pi}\frac{R\,d\theta}{(R^2+L^2)}\frac{R}{\sqrt{R^2+L^2}}$$

$$B_{ANELLO} = \frac{\mu_0 i}{\cancel{2}\cancel{4}\cancel{\pi}}\frac{\cancel{2\pi} R^2}{(R^2+L^2)^{3/2}} = \frac{\mu_0 i R^2}{2(R^2+L^2)^{3/2}}$$

4)



$\vec B = \hat z B$

IMMAGINIAMO UN ELETTRONE IN x

SENTE UNA FORZA $\vec F = -e\vec v \times \vec B$

QUINDI UN CAMPO $\vec E = \dfrac{\vec F}{-e} = \vec v \times \vec B$

$|\vec E| = E = vB = \omega x B$

$\vec E = \hat x E$

la forza spinge l'elettrone verso (O)
in cui il potenziale più alto è
quello più lontano da (O)

$$\mathcal{E} = \oint \vec E \cdot d\vec l = \int_D^{D+L} x\omega B\, dx = \omega B \int_D^{D+L} x\, dx =$$

$$fem = \mathcal{E} = \omega B \frac{1}{2} x^2 \Big|_D^{D+L} = \frac{\omega}{2} B \left[(D+L)^2 - (D)^2\right] = \Delta V$$

$$\Delta V = \frac{B}{2}\left[\cancel{D^2} + L^2 + 2DL - \cancel{D^2}\right] = \frac{\omega B}{2}\left[L^2 + 2DL\right] = \frac{1}{2}\omega B L (L + 2D)$$