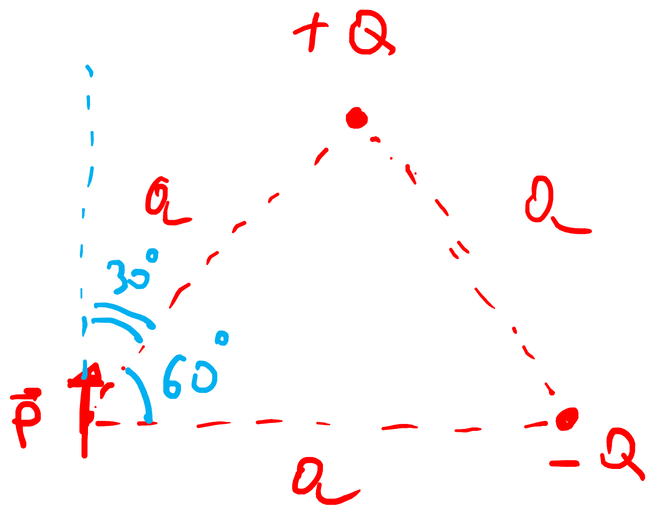
1)



POT. DIPOLO A DISTANZA 'a' ad un angolo θ

$$V(a,\theta) = \frac{p\cos\theta}{4\pi\varepsilon_0 a^2}$$

PER CUI:

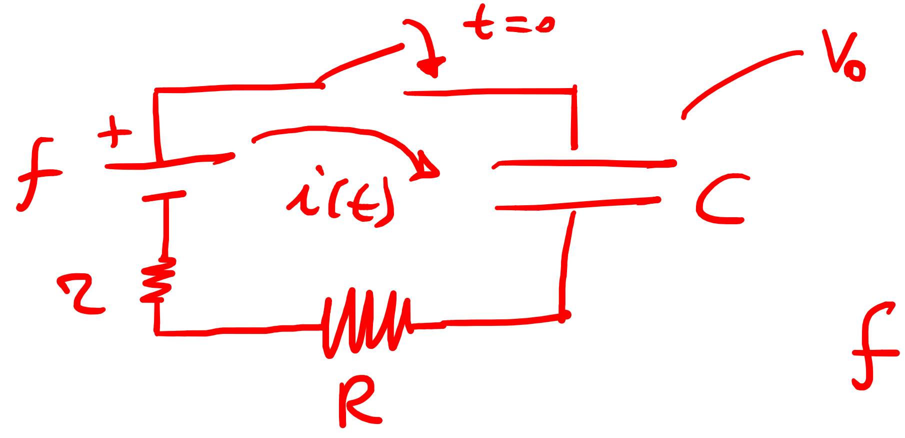
$$\text{ENERGIA}(\text{DIPOLO},+Q) = +Q\,V(a,30°) = \frac{+Q\,p\cos(30°)}{4\pi\varepsilon_0 a^2} = \frac{Qp\frac{\sqrt{3}}{2}}{4\pi\varepsilon_0 a^2}$$

$$\text{ENERGIA}(\text{DIP},+Q,-Q) = \text{ENERGIA}(\text{DIP.},+Q) + \text{ENERGIA}(+Q,-Q) + \text{ENERGIA}(\text{DIP},-Q) =$$

$$= \frac{Qp\cos(30°)}{4\pi\varepsilon_0 a^2} \underbrace{- Q\left(\frac{Q}{4\pi\varepsilon_0 a}\right)}_{-QV(a,a)} - \cancel{\frac{Qp\cos(90°)}{4\pi\varepsilon_0 a^2}} \to 0 =$$

$$= \frac{Q}{4\pi\varepsilon_0 a}\left[\frac{p\cos(30°)}{a} - Q\right] = \frac{Q}{4\pi\varepsilon_0 a}\left[\frac{p}{a}\frac{\sqrt{3}}{2} - Q\right]$$

2)



$i = \frac{dq_c}{dt}$ $q_{\text{CONDENS.}}$

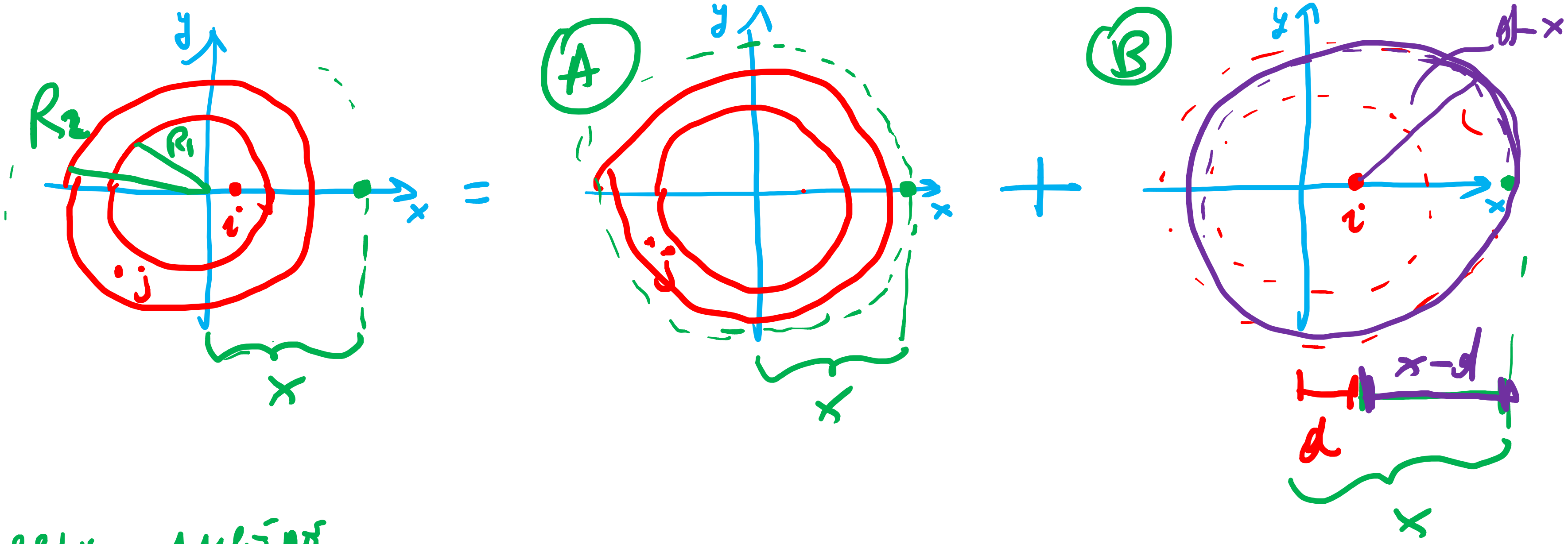
$$f - \frac{q_c(t)}{C} = (R+r)\, i(t) = (R+r)\frac{d\, q_c(t)}{dt}$$

$$Cf - q_c(t) = C(R+r)\frac{dq_c}{dt} \; ; \quad \frac{dt}{C(R+r)} = \frac{dq_c}{Cf - q_c} \; ; \quad -\int_0^{t^*} \frac{dt}{C(R+r)} = \int_{Q_0}^{Q(t^*)} \frac{dq_c}{q_c - Cf}$$

Con $Q(t^*) = V_1 \cdot C$

$$-\frac{t^*}{(R+r)C} = \ln \frac{Q(t^*) - Cf}{Q_0 - Cf} \rightarrow t^* = -C(R+r) \ln \frac{V_1 \cdot C - fC}{Q_0 - Cf}$$

3)



SOVR. EFFETTI

P.3

APPLICO AMPÈRE

(A) $2\pi x B_A = \mu_0 I_c = \mu_0 \left[j \cdot (\pi R_2^2 - \pi R_1^2) \right]$

(B) $2\pi (x-d) B_B = \mu_0 i$

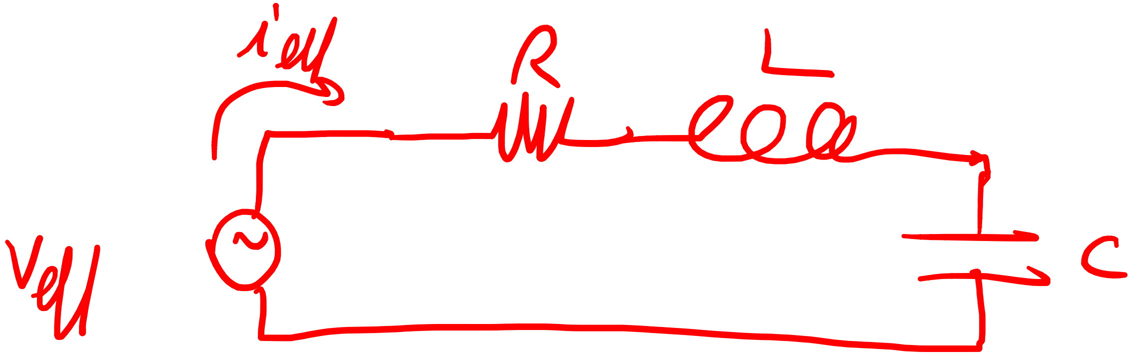
VOGLIO $B_{TOT} = B_A + B_B = 0 \rightarrow B_A = -B_B$

$$B_A = \frac{\cancel{\mu_0} j [\pi R_2^2 - \pi R_1^2]}{\cancel{2\pi} x} = -B_B = -\frac{\cancel{\mu_0} i}{\cancel{2\pi}(x-d)} \rightarrow (x-d) j\pi (R_2^2 - R_1^2) = x i$$

$$x [j\pi (R_2^2 - R_1^2) - i] = d j \pi (R_2^2 - R_1^2) \rightarrow x = \frac{d j \pi (R_2^2 - R_1^2)}{j\pi (R_2^2 - R_1^2) - i}$$

4)

P.4



$$\omega = 2\pi f$$

$$\cos\phi = \frac{R}{Z}$$

$$i_{eff} = \frac{V_{eff}}{Z} \qquad Z = \sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2} \qquad P_m = i_{eff} V_{eff} \cos\phi = \frac{V_{eff}^2 R}{Z^2}$$

è MAX se $\omega L = \frac{1}{\omega C} \rightarrow C = \frac{1}{L\omega^2}$

$$C_0 = \frac{C}{3} = \frac{1}{3L\omega^2} \qquad Z_0 = \sqrt{R^2 + \left(\omega L - \frac{1}{\omega C_0}\right)^2}$$

$$i_{0eff} = \frac{V_{eff}}{Z_0} \qquad \cos\phi_0 = \frac{R}{Z_0} \qquad P_{0,m} = i_{0eff} V_{eff} \cos\phi_0 \qquad V_{0,L\,eff} = Z_{0L}\, i_{0eff} =$$

$$= \omega L\, i_{0eff}$$