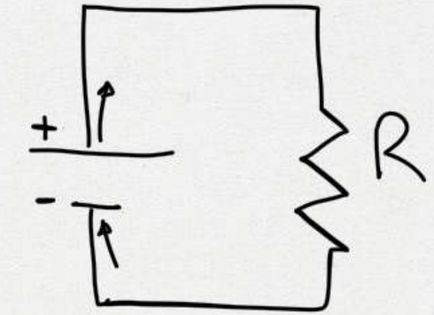
$$\Delta V = R i \longleftrightarrow q = C \Delta V$$

OHM

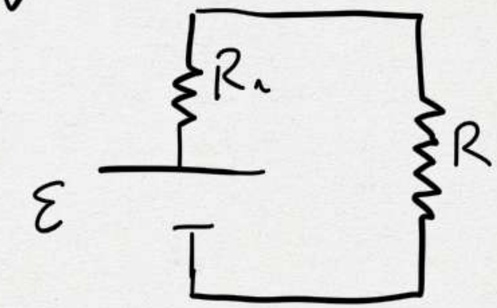
$$\Delta V = V_A - V_B = \int_A^B \vec{E} \cdot d\vec{s} = R i$$



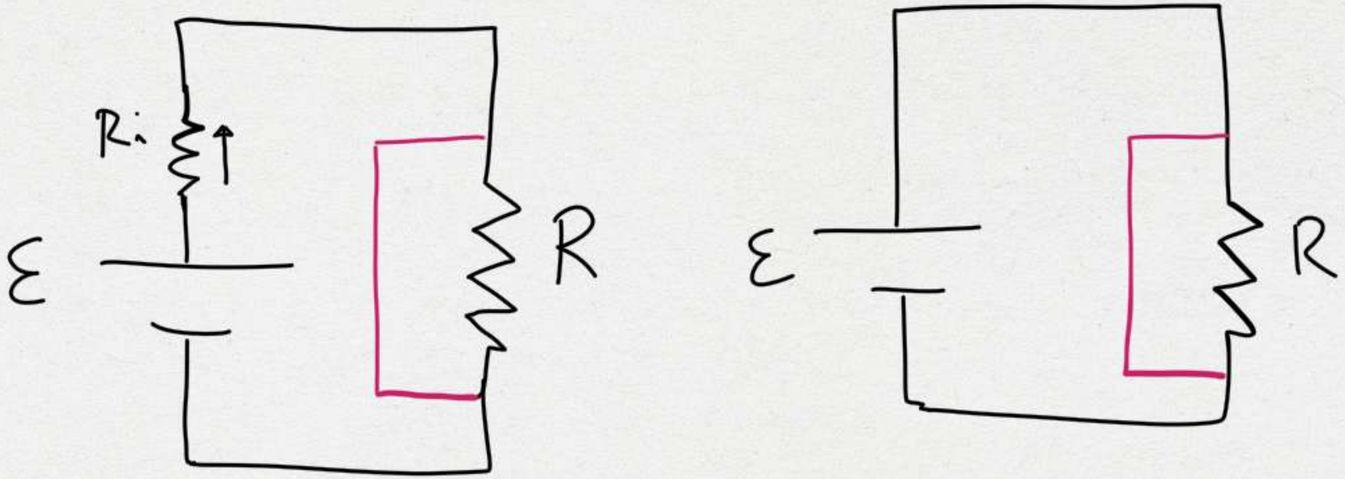
$$\oint_{\text{CIRCUITO}} \vec{E} \cdot d\vec{s} = R i = \mathcal{E}$$

FORZA ELETTROMOTRICE

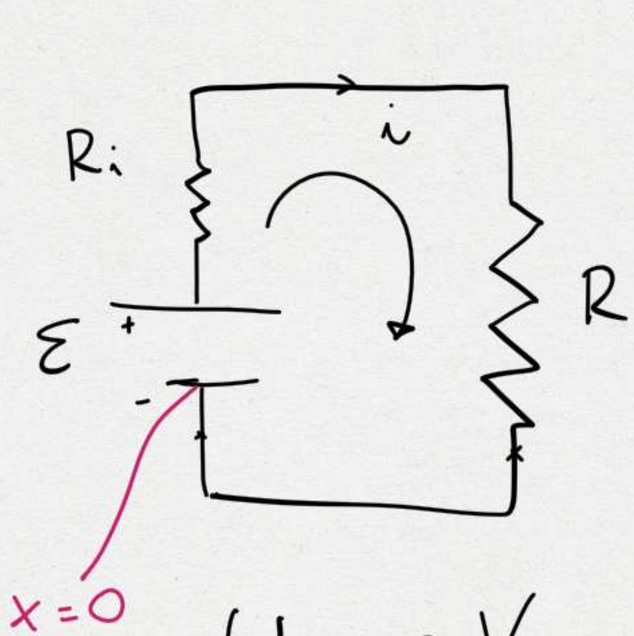
$[\mathcal{E}] = V$

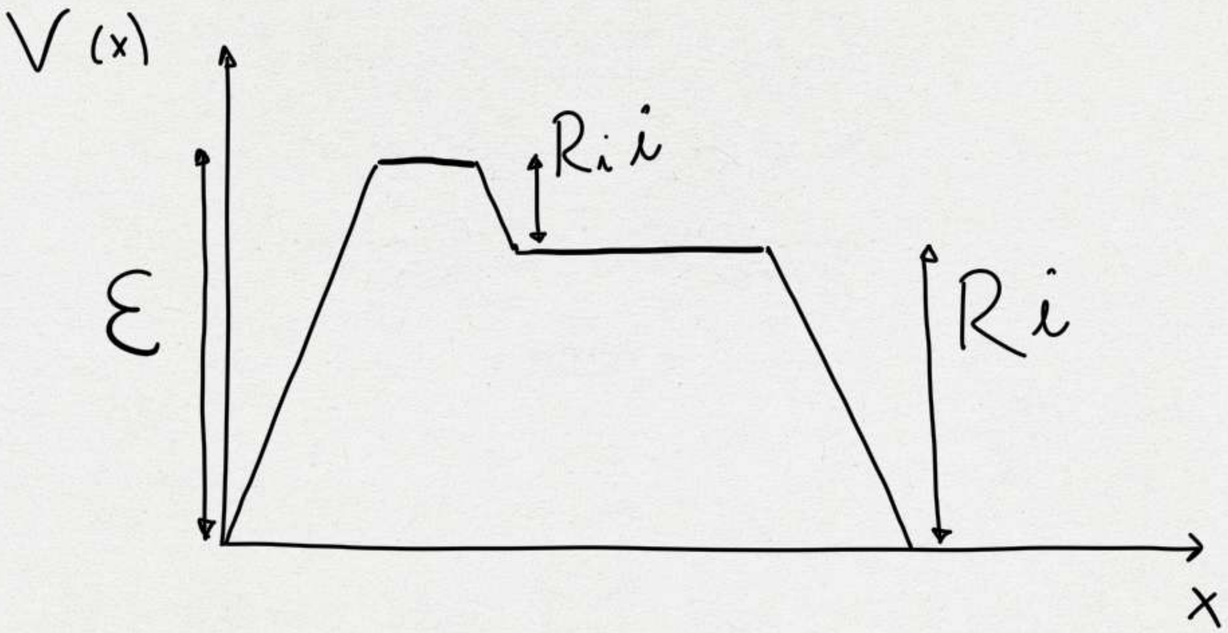


$$\mathcal{E} = (R + R_i)\, i \Rightarrow i = \frac{\mathcal{E}}{R + R_i} < \frac{\mathcal{E}}{R}$$


R_i
$\mathcal{E}$
R

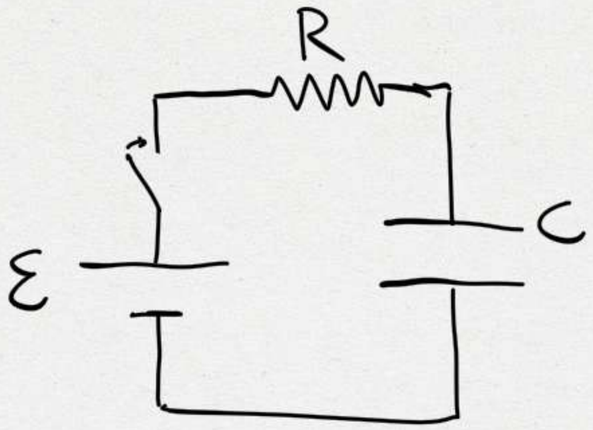
$\mathcal{E}$
R





$$U_e = q \cdot V$$

CIRCUITO RC



$$\mathcal{E} = R\,i(t) + \Delta V_c(t) = R\,i(t) + \frac{q(t)}{C} =$$

$$= R\,\underbrace{\frac{dq}{dt}} + \frac{q(t)}{C} \Rightarrow$$

$$\mathcal{E} = R\frac{dq}{dt} + \frac{q}{C} \Rightarrow \mathcal{E}C = RC\frac{dq}{dt} + q \Rightarrow \mathcal{E}C - q = RC\frac{dq}{dt} \Rightarrow$$

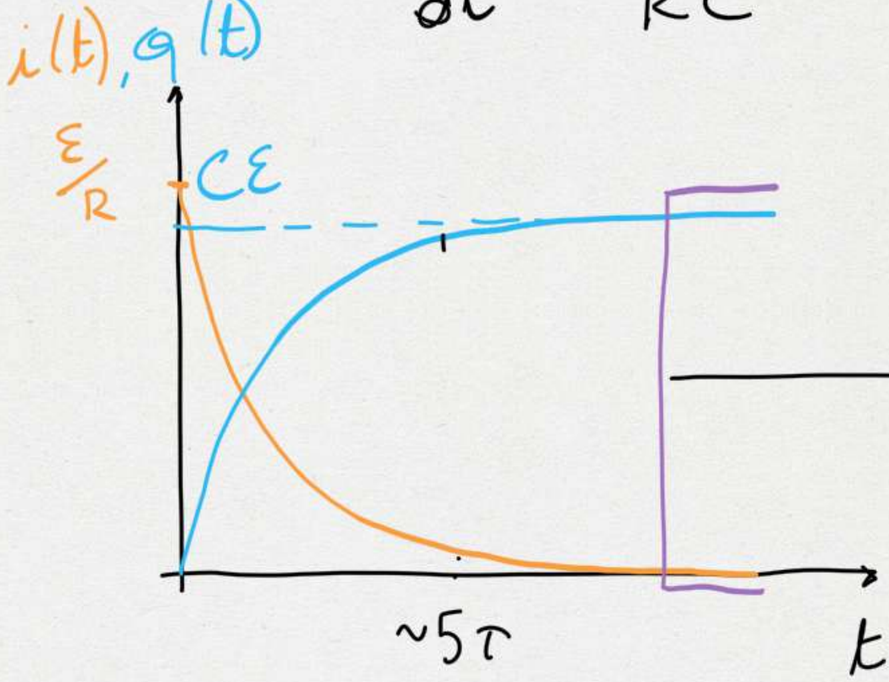
$$\frac{dt}{RC} = \frac{dq}{\mathcal{E}C - q} \Rightarrow -\frac{dt}{RC} = \frac{dq}{q - \mathcal{E}C} \Rightarrow$$

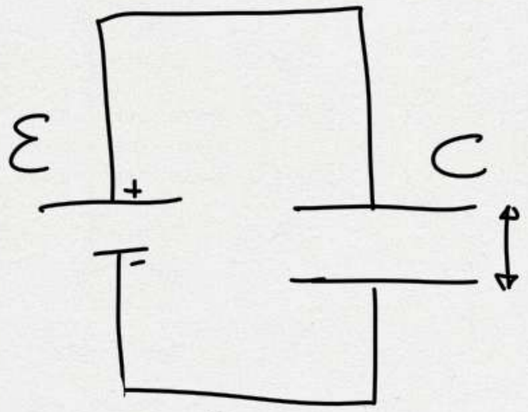
$$-\frac{t}{RC} = \int_0^q \frac{dq'}{q' - \mathcal{E}C} = \log(q' - \mathcal{E}C)\Big|_0^q = \log\left(\frac{q - \mathcal{E}C}{-\mathcal{E}C}\right) = \log\left(\frac{\mathcal{E}C - q}{\mathcal{E}C}\right)$$

$$e^{-t/RC} = \frac{C\mathcal{E} - q}{\epsilon\mathcal{E}} \Rightarrow q(t) = C\mathcal{E}\left(1 - e^{-t/RC}\right) \qquad [RC] = s$$

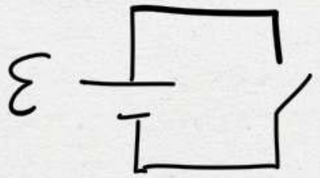
$$RC = \tau$$

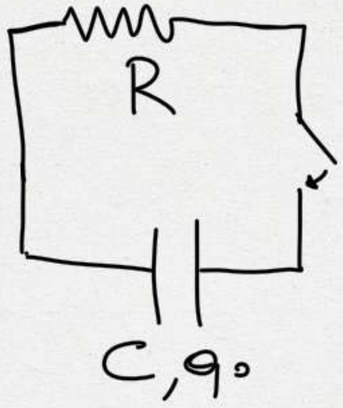
$$\Rightarrow i(t) = \frac{dq}{dt} = \frac{C\mathcal{E}}{RC} e^{-t/RC} = \frac{\mathcal{E}}{R} e^{-t/RC}$$





$$\Delta V = \frac{q}{C} = \mathcal{E}$$





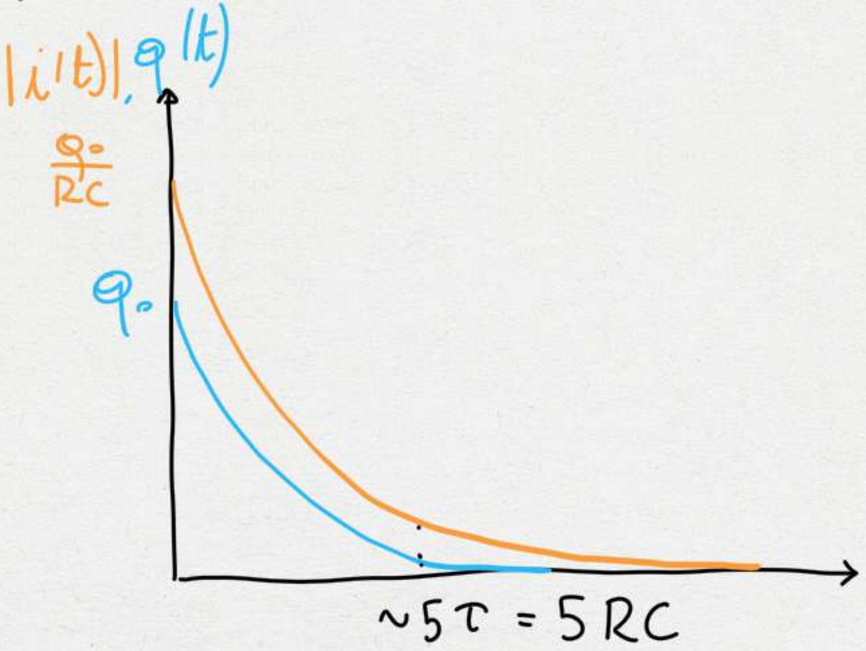
$$R\,i(t) + \Delta V_c = 0 \Rightarrow$$

$$R\frac{dq}{dt} = -\frac{q}{C} \Rightarrow -\frac{RC}{dt} = \frac{q}{dq} \Rightarrow -\frac{dt}{RC} = \frac{dq}{q} \Rightarrow$$

$$-\frac{t}{RC} = \int_{q_0}^{q} \frac{dq'}{q'} = \log\left(\frac{q}{q_0}\right) \Rightarrow e^{-\frac{t}{RC}} = \frac{q}{q_0} \Rightarrow$$

$$q(t) = q_0\, e^{-\frac{t}{RC}}$$

$$i(t) = -\frac{q_0}{RC}\, e^{-\frac{t}{RC}}$$

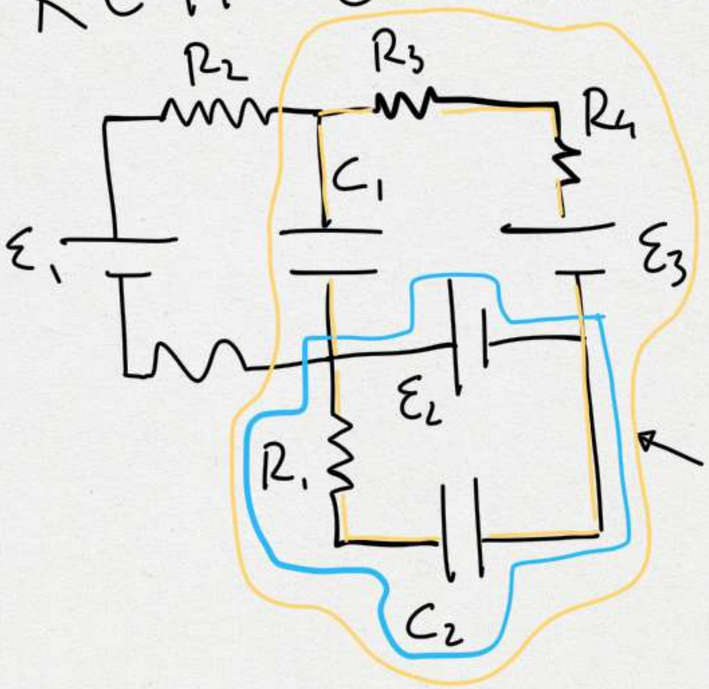


$$U_e^{(i)} = \frac{1}{2}\frac{q_0^2}{C}, \quad U_e^{(f)} = 0$$

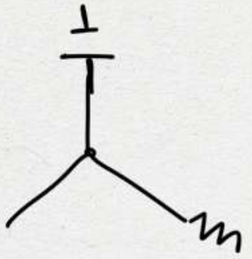
$$P = R i^2(t) = R \frac{q_0^2}{R^2 C^2} e^{-\frac{2t}{\tau}} \Rightarrow$$

$$W = \int_0^\infty P(t)\,dt = \frac{q_0^2}{RC^2} \int_0^\infty e^{-\frac{2t}{\tau}} dt = -\frac{q_0^2 \tau}{2RC^2} e^{-\frac{2t}{\tau}} \Big|_0^\infty = \frac{q_0^2 RC}{2RC^2} = \frac{1}{2}\frac{q_0^2}{C}$$

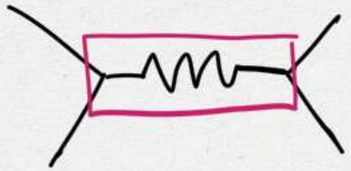
RETI ELETTRICHE



① NODO

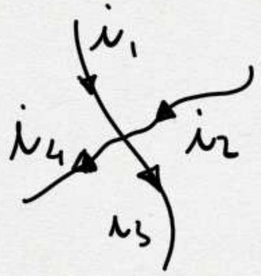


② RAMO



③ MAGLIA

I LEGGE DI KIRCHHOFF (LEGGE DEI NODI)

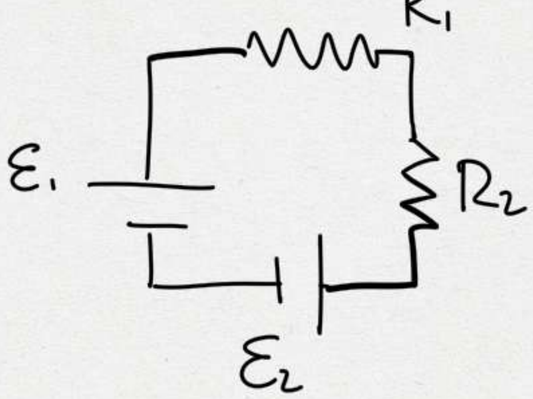


$$\sum_{K=1}^{N} i_K = 0$$

$$i_1 + i_2 - i_3 - i_4 = 0 \qquad -i_1 - i_2 + i_3 + i_4 = 0$$

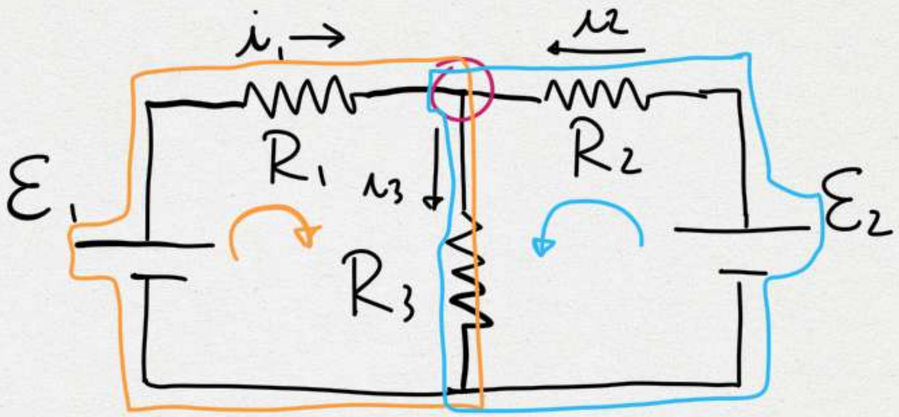
II LEGGE DI KIRCHHOFF

$$\mathcal{E} = Ri$$



$$\sum_{k=1}^{N_{RAMI}} \mathcal{E}_k = \sum_{k=1}^{N_{RAMI}} i_k R_k$$

ESEMPIO (SIMILE A 5.10)



$$\begin{cases} i_1 + i_2 - i_3 = 0 \Rightarrow i_3 = i_1 + i_2 \\ \mathcal{E}_1 = R_1 i_1 + R_3 i_3 \\ \mathcal{E}_2 = R_2 i_2 + R_3 i_3 \end{cases}$$

$$\begin{cases} \mathcal{E}_1 = 10\,V \\ \mathcal{E}_2 = 20\,V \\ R_1 = 10\,\Omega \\ R_2 = 20\,\Omega \\ R_3 = 40\,\Omega \end{cases}$$

$$\begin{cases} i_1 = -0.143\,A \\ i_2 = 0.429\,A \\ i_3 = 0.286\,A \end{cases}$$