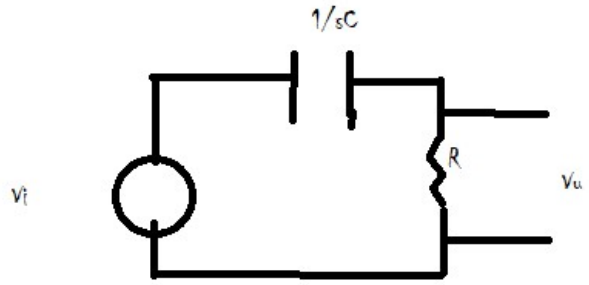
Circuito RC

Uscita sul resistore



$$V_i(s) = i(s)\left(R + \frac{1}{sC}\right) = \frac{V_R(s)}{R}\left(R + \frac{1}{sC}\right) \qquad G(s) = \frac{V_R}{V_i} = \frac{sRC}{(sRC+1)}$$

$$G(s) = \frac{3}{s+45} \quad g(t) = 3e^{-45t}$$

$$G(s) = \frac{RCs}{1+RCs}$$

V(s)=$\frac{K}{s}$

$$V_r(s) = \frac{K}{s}\frac{RCs}{1+RCs} = \frac{RC}{1+RCs} = \frac{RC}{RC(\frac{1}{RC}+s)} = \frac{K}{(\frac{1}{RC}+s)}$$

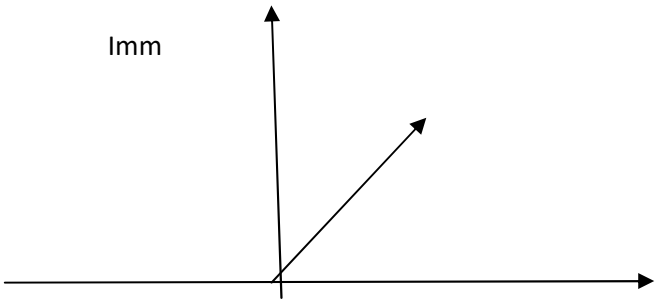
$$V_R(t) = Ke^{\frac{-t}{RC}}$$

R=10000Ω

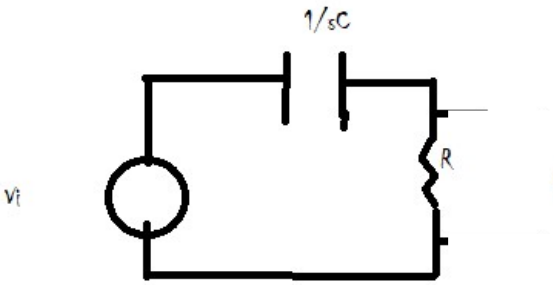
C=10nF=10^{-8} F **Caso particolare ω=30 Hz**

R*C=10^{-4}s

$|G(\omega)|=\omega R*C/(1+(\omega RC)^2)^{1/2}$



Uscita sul condensatore



$$V_i(s) = V_R(s) + V_c(s) = R * i(s) + \frac{1}{sC} i(s) = i(s)\left(R + \frac{1}{sC}\right) = V_c(s) * sC\left(R + \frac{1}{sC}\right) = V_c sC\left(\frac{sRC+1}{sC}\right)$$
$$= V_c(1 + sRC)$$

$$\frac{V_i(s)}{v_c(s)} = 1 + sRC \quad \frac{V_c(s)}{V_i(s)} = \frac{1}{1+sRC} = \frac{1}{RC(\frac{1}{RC} + s)}$$

$$V_i(s) = \frac{k}{s} \qquad V_c(s) = \frac{k}{s}\frac{1}{RC(\frac{1}{RC}+s)} = \frac{A}{s} + \frac{B}{\frac{1}{RC}+s}$$

$$V_u(t) = A + Be^{-\frac{t}{RC}}$$

Caso generale:diagrammi di Bode

Si valuta l'andamento di un sistema o di un circuito per tutte le frequenze possibili (0; +00)

Funzione di trasferimento di un circuito RC con uscita sul resistore

zero s=0; polo s=-1/RC=-10000

$$G(s) = \frac{10^{-4}s}{1+s1^{-4}}$$

$|G(s)|=-80+20\log|s|-20\log|1+s10^{-4}|$

$\phi(s)=90°-\text{arctg}(s*10^{-4})=$

1. s=1000 $\phi(1000)=-\text{arctg}(0.1)=0$
2. s=10000 $\phi(1000)=-\text{arctg}(1)=-45°$
3. s=100000 $\phi(10000)=-\text{arctg}(10)=-90$

Grafico parziale

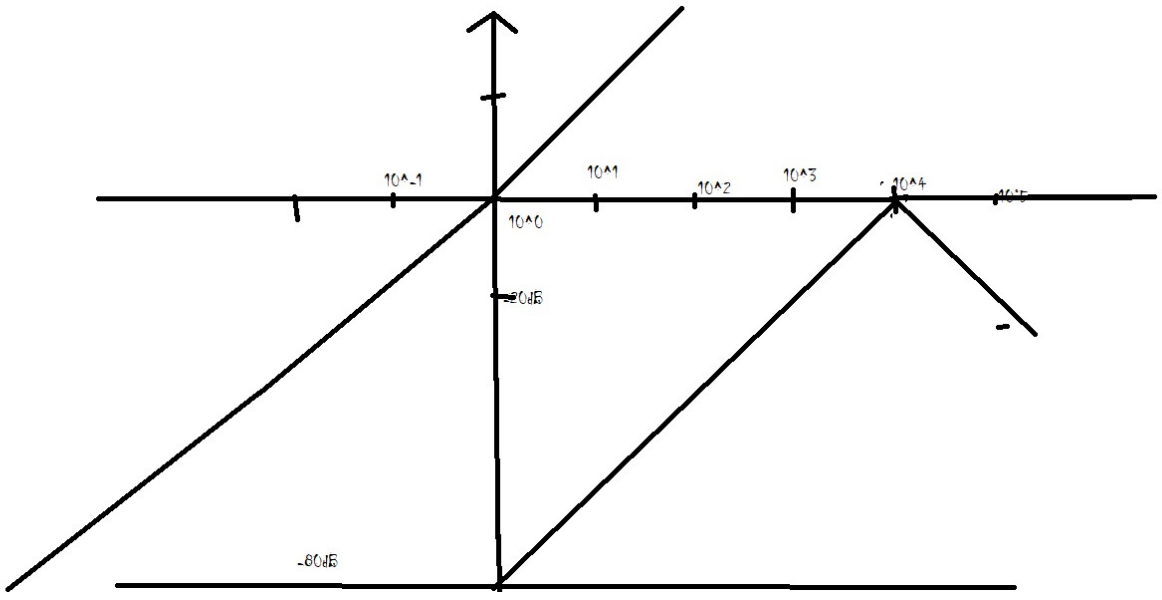
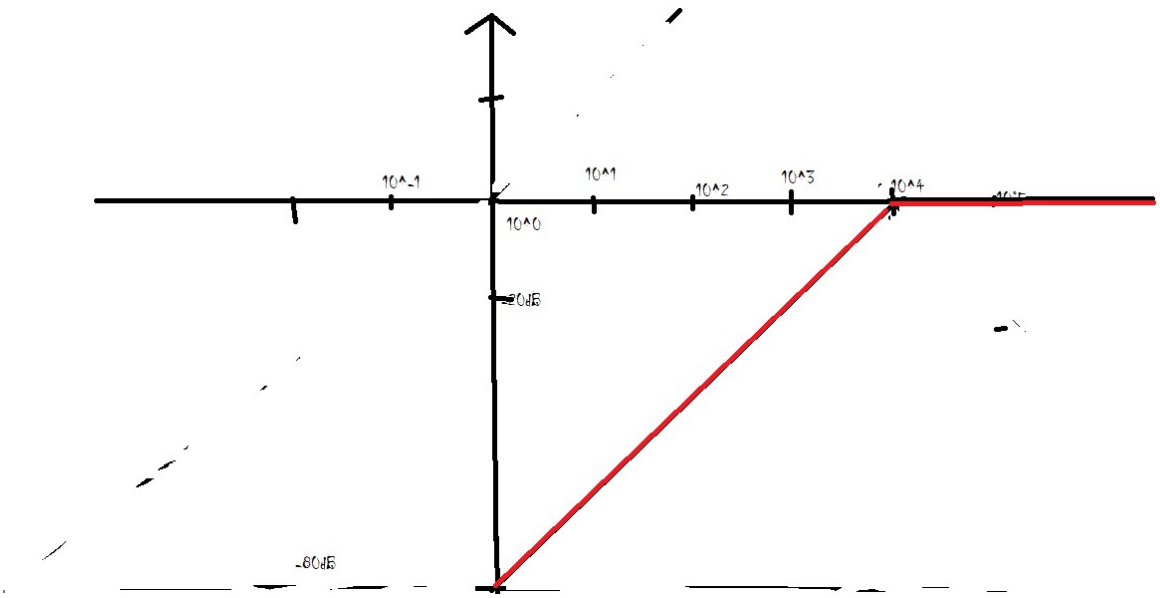


Grafico totale



Sfasamento