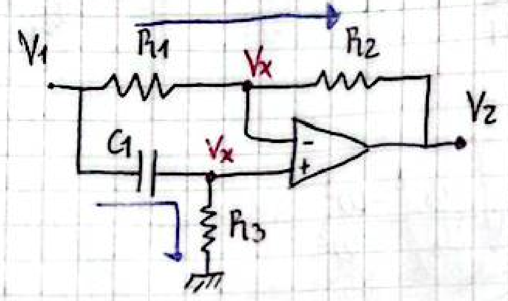
TP Semanal 1



$$\frac{V_1-V_x}{R_1}=\frac{V_x-V_2}{R_2}$$

$$\frac{V_1-V_x}{\frac{1}{SC_1}}=\frac{V_x}{R_3} \rightarrow S.C_1.V_1 - S.C_1.V_x = \frac{V_x}{R_3}$$

$$S.C_1.V_1 = V_x.\left(\underbrace{\frac{1}{R_3}+SC_1}_{\rightarrow\ \frac{1+S.C_1.R_3}{R_3}}\right)$$

$$\boxed{V_x = V_1.\left(\frac{SC_1.R_3}{1+SC_1R_3}\right)} \quad (1)$$

$$\frac{V_1}{R_1}-\frac{V_x}{R_1}=\frac{V_x}{R_2}-\frac{V_2}{R_2} \rightarrow \frac{V_1}{R_1}+\frac{V_2}{R_2}=V_x.\left(\overbrace{\frac{1}{R_1}+\frac{1}{R_3}}^{\frac{R_1+R_2}{R_1.R_2}}\right)$$

pongo (1)

$$\frac{V_1}{R_1}+\frac{V_2}{R_2}=V_1.\underbrace{\left(\frac{SC_1R_3}{1+S.C_1.R_3}\right).\left(\frac{R_1+R_2}{R_1.R_2}\right)}_{\rightarrow\ \frac{S.C_1.R_3.(R_1+R_2)}{R_1R_2+S.C_1.R_1.R_2.R_3}}$$

$$\frac{V_2}{R_2}=V_1.\left(\frac{S.C_1R_3.(R_1+R_2)}{S.C_1.R_1R_2R_3+R_1.R_2}-\frac{1}{R_1}\right)$$

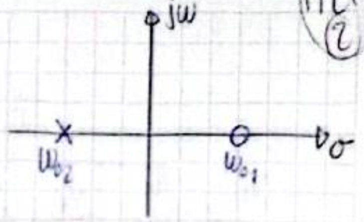
$$H(s)=\frac{V_2}{V_1}=\frac{S.C_1.R_1.R_2.R_3.[R_1+\cancel{R_2}-\cancel{R_2}]-R_1.R_2^2}{S.C_1.R_1^2.R_2.R_3+R_1^2.R_2}$$

$$H(S)=\frac{C_1.R_1^2R_2R_3}{C_1R_1^2R_2R_3}.\frac{S-\frac{\cancel{R_1}.R_2^{\cancel{2}}}{C_1.R_1^{\cancel{2}}.\cancel{R_2}.R_3}}{S+\frac{\cancel{R_1^2}.\cancel{R_2}}{C_1.\cancel{R_1^2}\cancel{R_2}R_3}}$$

TPL1 (2)

$$\boxed{H(s) = \frac{s - \frac{R_2}{C_1 R_1 R_3}}{s + \frac{1}{C_1 \cdot R_3}}} \rightarrow \omega_{0_2} = \frac{1}{C_1 \cdot R_3}$$

$$\omega_{0_1} = \omega_{0_2} \cdot \frac{R_2}{R_1}$$



$$H(j\omega) = \frac{j\omega - \omega_{0_2} \cdot \frac{R_2}{R_1}}{j\omega + \omega_{0_2}} \rightarrow |H(j\omega)| = \sqrt{\frac{\omega_{0_1}^2 - \omega^2}{\omega_{0_2}^2 - \omega^2}}$$

TPL1 Corrección (1)

si $H(j\omega) = \frac{j\omega - \omega_{0_2} \cdot \frac{R_2}{R_1}}{j\omega + \omega_{0_2}}$ | $\omega_{0_2} = \frac{1}{C_1 \cdot R_3}$

utilizo $\boxed{\Delta\omega = \omega_{0_2}}$ porque va a ser el punto más cercano al polo y ~~[illegible]~~ al cero

$$H(s) = \frac{s\,\omega_{0_2} - \omega_{0_2} \frac{R_2}{R_1}}{s\,\omega_{0_2} + \omega_{0_2}}$$

$$\boxed{H(s) = \frac{s - \frac{R_2}{R_1}}{s + 1}}$$

Considero $\Delta z = R_3$ porque no influye en la corriente de R_1 y R_2 y es un punto común entre el polo y el cero. El C_1 no lo toco

si $\omega_{0_2} = 1 = \frac{1}{C_1 \cdot R_3} \xrightarrow{\text{si } \Delta z = R_3} \boxed{C_1' = 1}\ \boxed{R_3' = 1}$

tomo que es uno para todo

$\therefore\ 1 = \frac{R_2}{R_1} \rightarrow \boxed{R_1' = R_2'} \rightarrow$ y si digo $\boxed{R_1' = R_2' = R_3' = 1}$

$$\boxed{H(s) = \frac{s - 1}{s + 1}}$$

TP2 1
Corrección
(2)

- Asumo que el OPAMP es ideal, por ende no hay circulación de corriente por sus terminales + y -, pero sus potenciales son iguales

- si $H(j\omega) = \dfrac{j\omega - \omega_{02}\cdot\frac{R_2}{R_1}}{j\omega + \omega_{02}}$

$$H(j\omega) = \frac{\sqrt{\omega^2 + \left(\omega_{02}\cdot\frac{R_2}{R_1}\right)^2}}{\sqrt{\omega^2 + \omega_{02}^2}} \cdot \frac{e^{j\,\mathrm{arctg}\left(\frac{\omega}{-\omega_{02}\cdot\frac{R_2}{R_1}}\right)}}{e^{j\,\mathrm{arctg}\left(\frac{\omega}{\omega_{02}}\right)}}$$

$$\boxed{|H(\omega)| = \sqrt{\frac{\omega^2 + \left(\omega_{02}\cdot\frac{R_2}{R_1}\right)^2}{\omega^2 + \omega_{02}^2}}}$$

$$\boxed{|H(0)|\Big|_{\omega=0} = \frac{R_2}{R_1}}$$

$$|H(\omega_{02})|\Big|_{\omega=\omega_{02}} = \sqrt{\frac{\cancel{\omega_{02}^2} + \cancel{\omega_{02}^2}\left(\frac{R_2}{R_1}\right)^2}{\cancel{\omega_{02}^2} + \cancel{\omega_{02}^2}}}$$

$$= \frac{1 + \left(\frac{R_2}{R_1}\right)^2}{2} \rightarrow \boxed{|H(\omega_{02})| = \frac{1}{2} + \frac{1}{2}\cdot\left(\frac{R_2}{R_1}\right)^2}$$

$$\boxed{|H(\infty)|\Big|_{\omega\to\infty} = 1}$$

TPL1 Corrección 3

$$\measuredangle H(\omega) = e^{j\left[\operatorname{arctg}\left(\frac{\omega}{-\omega_{02}\cdot\frac{R_2}{R_1}}\right) - \operatorname{arctg}\left(\frac{\omega}{\omega_{02}}\right)\right]}$$

$\hookrightarrow$ si $\measuredangle H(0) = e^{j[\underbrace{\operatorname{arctg}(0)}_{0} - \underbrace{\operatorname{arctg}(0)}_{0}]} \rightarrow \boxed{\measuredangle H(0) = 0.}$

$\hookrightarrow$ si $\measuredangle H(\infty) = e^{j[\underbrace{\operatorname{arctg}(-\infty)}_{-\pi/2} - \underbrace{\operatorname{arctg}(\infty)}_{\pi/2}]} \rightarrow \boxed{\measuredangle H(\infty) = -\pi}$

$\hookrightarrow$ si $\measuredangle H(\omega_{02}) = e^{j\left[\operatorname{arctg}\left(-\frac{R_1}{R_2}\right) - \underbrace{\operatorname{arctg}(1)}_{\pi/4}\right]}$

$\hookrightarrow$ si $R_1 \gg\gg R_2 \rightarrow e^{j\left[\operatorname{arctg}\left(-\frac{R_1}{R_2}\right) - \frac{\pi}{4}\right]}$

$\hookrightarrow$ tiende a $-\frac{\pi}{2}$

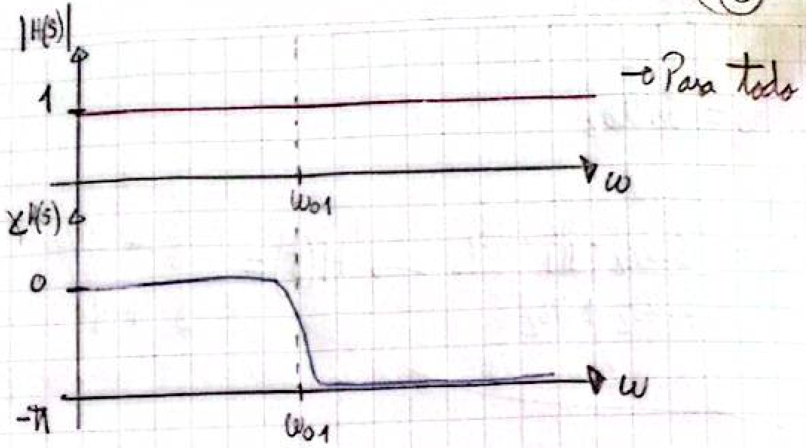
$\hookrightarrow$ si $R_1 \ll\ll R_2 \rightarrow e^{j\left[\operatorname{arctg}\left(-\frac{R_1}{R_2}\right) - \frac{\pi}{4}\right]}$

$\hookrightarrow$ tiende a 0

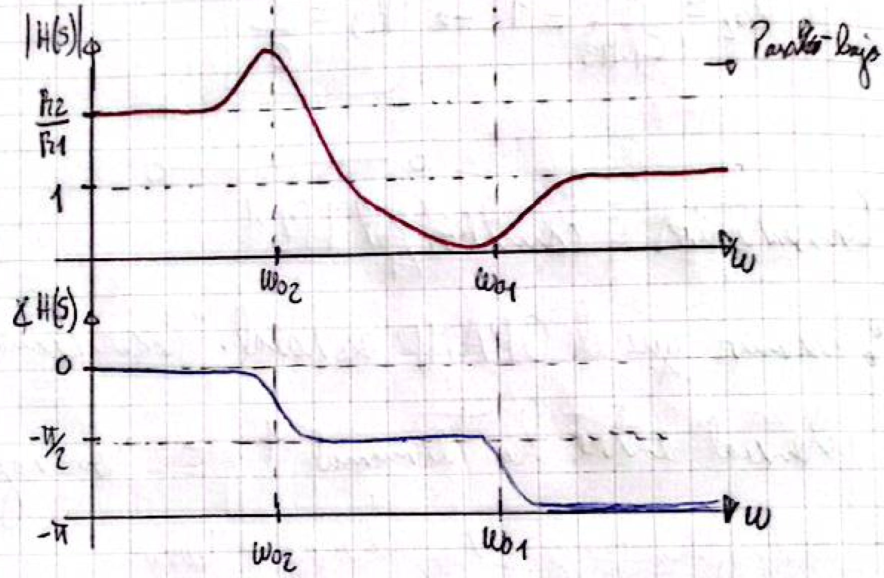
$\hookrightarrow$ si $R_1 = R_2 \rightarrow e^{j\left[\operatorname{arctg}(-1) - \frac{\pi}{4}\right]} = \boxed{-\frac{\pi}{2}}$

$\hookrightarrow$ es $-\frac{\pi}{4}$

• Si $\frac{R_2}{R_1}=1 \to \omega_{o1}=\omega_{o2} \to$



• Si $\frac{R_2}{R_1}>1 \to \omega_{o1}>\omega_{o2}$



• Si $\frac{R_2}{R_1}<1 \to \omega_{o1}<\omega_{o2}$