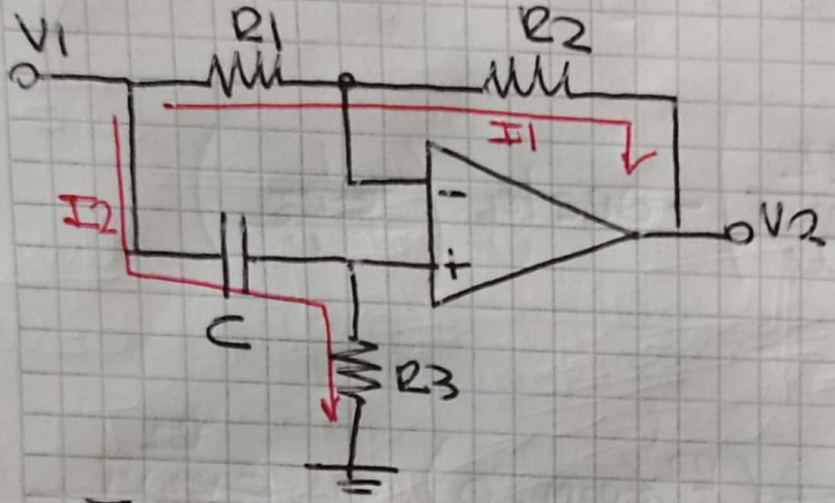
Trabajo semanal 1

Ejercicio 7 TP1



$$I_1 = \frac{V_1 - V_2}{R_1 + R_2} = \frac{V_{R3} - V_2}{R_2}, \quad V_{R3} = V_1 \frac{R_3}{R_3 + \frac{1}{sC}}$$

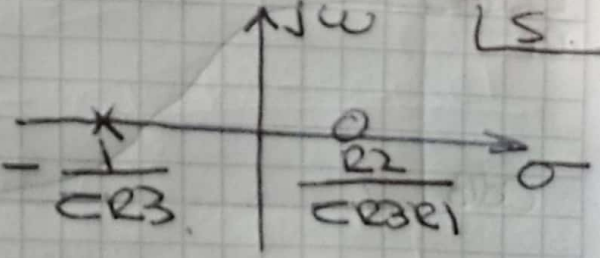
$$\frac{V_1}{R_1+R_2} - \frac{V_2}{R_1+R_2} = V_1 \frac{R_3}{R_2} \frac{sC}{sCR_3+1} - \frac{V_2}{R_2} = V_1 \frac{sCR_3}{sCR_3+1}$$

$$V_1 \left(\frac{1}{R_1+R_2} - \frac{R_3}{R_2} \frac{sC}{sCR_3+1} \right) = V_2 \left(\frac{1}{R_1+R_2} - \frac{1}{R_2} \right)$$

$$V_1 \left[\frac{sCR_3R_2 + R_2 - sCR_3R_1 - sCR_3R_2}{(R_1+R_2)R_2(sCR_3+1)} \right] = V_2 \frac{R_2 - R_1 - R_2}{(R_1+R_2)R_2}$$

$$\frac{V_2}{V_1} = +\frac{1}{R_1} \frac{sCR_3R_1 - R_2}{sCR_3 + 1} = \frac{s - \frac{R_2}{CR_3R_1}}{s + \frac{1}{CR_3}}$$

$$T(s) = \frac{s - \frac{R_2}{CR_3R_1}}{s + \frac{1}{CR_3}}$$



$$\therefore T(\omega) = \frac{j\omega - \frac{R_2}{CR_3R_1}}{j\omega - \frac{1}{CR_3}}$$

Módulo.

$$|T(\omega)| = \sqrt{\frac{\left(\frac{R2}{CR3R1}\right)^2 + \omega^2}{\left(\frac{1}{CR3}\right)^2 + \omega^2}}$$

FASE

$$\theta(\omega) = \operatorname{arctg}\left(\frac{-\frac{R2}{CR3R1}}{\omega}\right) - \operatorname{arctg}\left(\frac{-\frac{1}{CR3}}{\omega}\right)$$

Método gráfico.

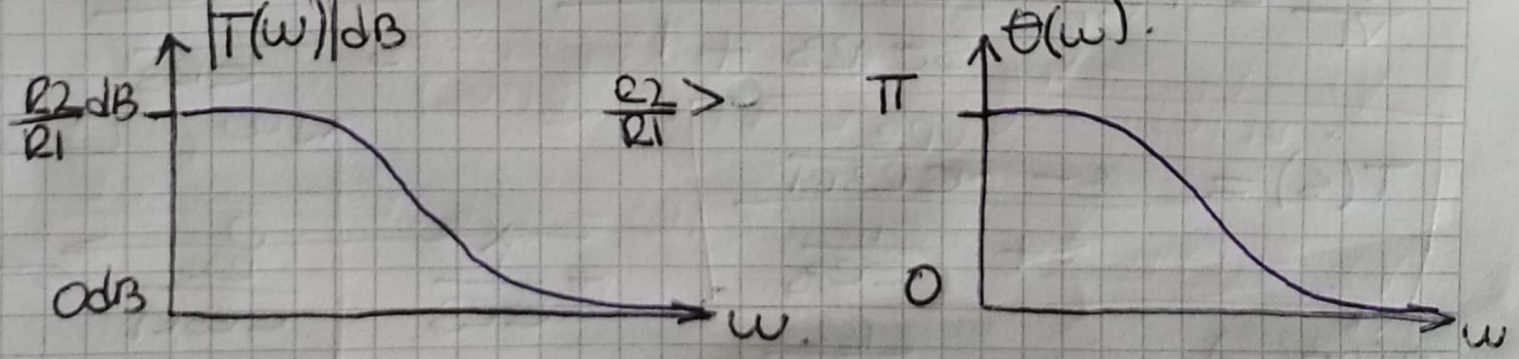
- $\omega = 0 \quad |T(0)| = \dfrac{dist\left(\frac{R2}{CR3R1}, 0\right)}{dist\left(\frac{1}{CR3}, 0\right)} = \dfrac{\frac{R2}{CR3R1}}{\frac{1}{CR3}}$

$$|T(0)| = \frac{R2}{R1}$$

- $\omega \to +\infty \quad |T(\to +\infty)| = \dfrac{dist\left(\frac{R2}{CR3R1}, +\infty\right)}{dist\left(\frac{R2}{CR3R1}, +\infty\right)} = \dfrac{\to +\infty}{\to +\infty} = 1$

- $\omega = 0. \quad \theta(0) = \pi - 0 = \pi.$

- $\omega \to +\infty \quad \theta(\to +\infty) = \pi/2 - \pi/2 = 0.$



$$2-\quad \Omega_w = \frac{1}{CR_3} \Rightarrow \quad \$ = \frac{s}{\Omega_w} = \frac{s}{1/CR_3}$$

$$s = \$\,\frac{1}{CR_3}$$

$$T(\$) = \frac{\$\,\frac{1}{CR_3} - \frac{R_2}{CR_3R_1}}{\$\,\frac{1}{CR_3} + \frac{1}{CR_3}}$$

$$T(\$) = \frac{\$ - \frac{R_2}{R_1}}{\$ + 1}$$

$$Z_2 = \frac{1}{sC} + R_3 = \frac{1}{\frac{\$}{CR_3}C} + R_3 = \frac{1}{\$\left(\frac{1}{R_3}\right)C^{-1}} + R_3$$

$$Z_2 = \frac{1}{\$C'} + R_3$$

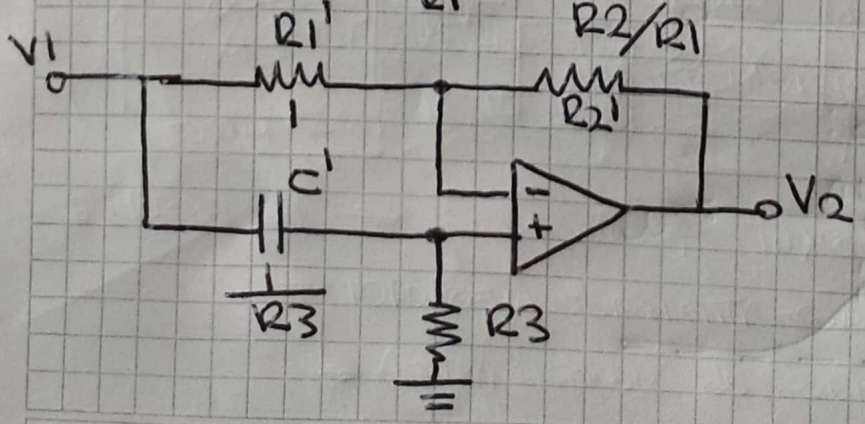
$$Z_1 = R_1 + R_2, \quad \Omega_z = R_1$$

$$\Rightarrow Z_1 = 1 + \left(\frac{R_2}{R_1}\right)R_2'$$

$$Z_1 = 1 + R_2'$$

$$\Rightarrow C' = \frac{1}{R_3}$$

$$R_2' = \frac{R_2}{R_1}$$



$$R_1' = 1$$

$$R_2' = \frac{R_2}{R_1}$$

$$C' = \frac{1}{R_3}$$

$$R_3' = R_3$$

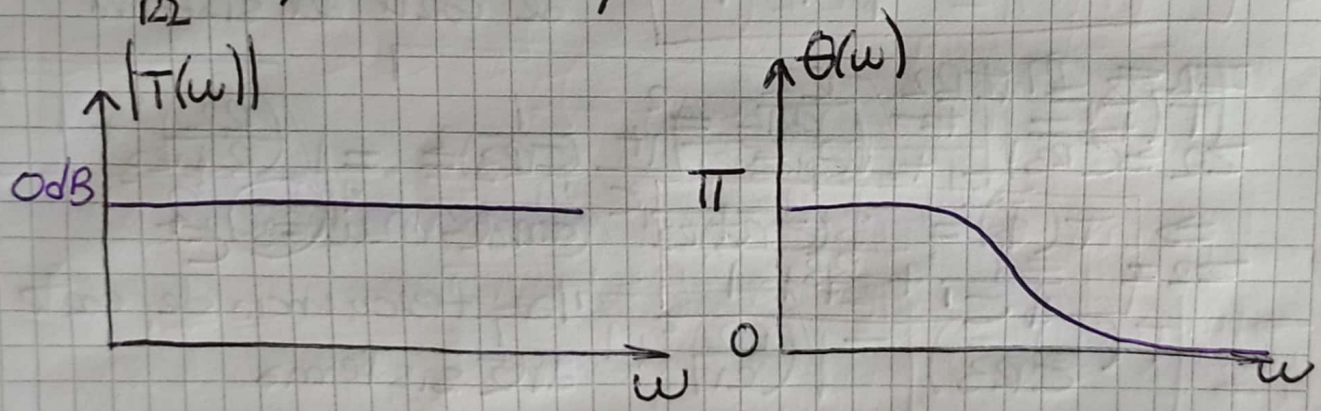
NOTA

donde $\begin{cases} C = \frac{C'}{\Omega w} \\ R3 = R3' \\ R2 = R2'\Omega z \\ R1 = {}'\Omega z \end{cases}$, $\Omega w = \frac{1}{CR3}$

$\Omega z = R1$

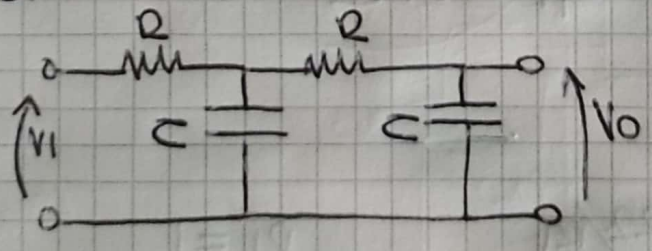
$$\Rightarrow \boxed{T(\$) = \frac{\$ - R2'}{S + 1}}$$

PARA $\frac{R1}{R2} = 1$, $R3 = 1K$ $C = 1\mu F$.

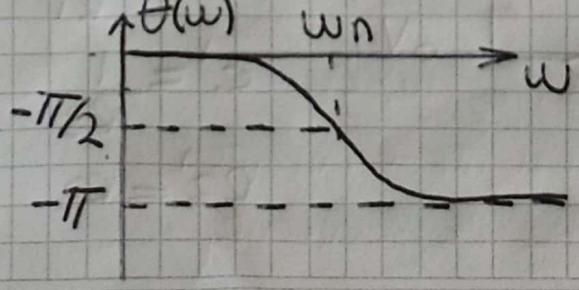


Utilidad

sea el siguiente FILTRO PASA BAJOS DE segundo orden:



cuya fase es:

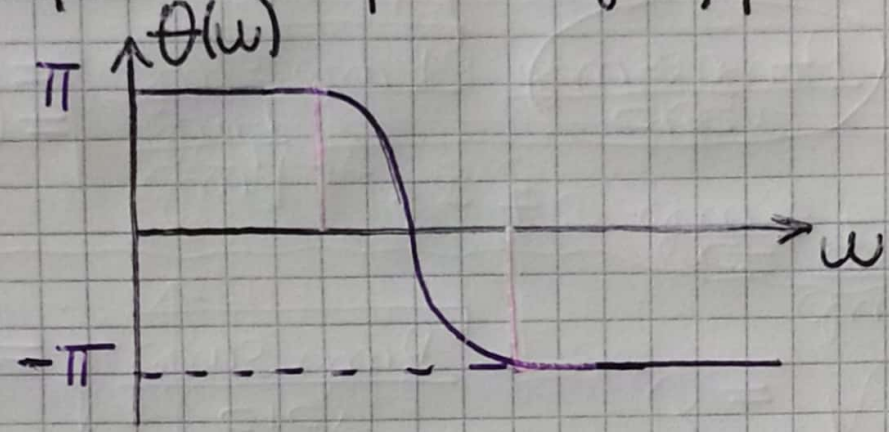


$\frac{R_2}{R_1} = 1$

HOJA Nº

FECHA

- Si cascadeamos el Filtro pasa todo con el PASABAJOS, ala magnitud del Filtro resultante no se modifica con respecto al pasa bajos, pero la fase:



Quiere decir que existe una frecuencia a la cual el Filtro no tiene cambio de fase.

⇒ El Filtro PASA TODOS ES UN CORRECTOR DE FASE