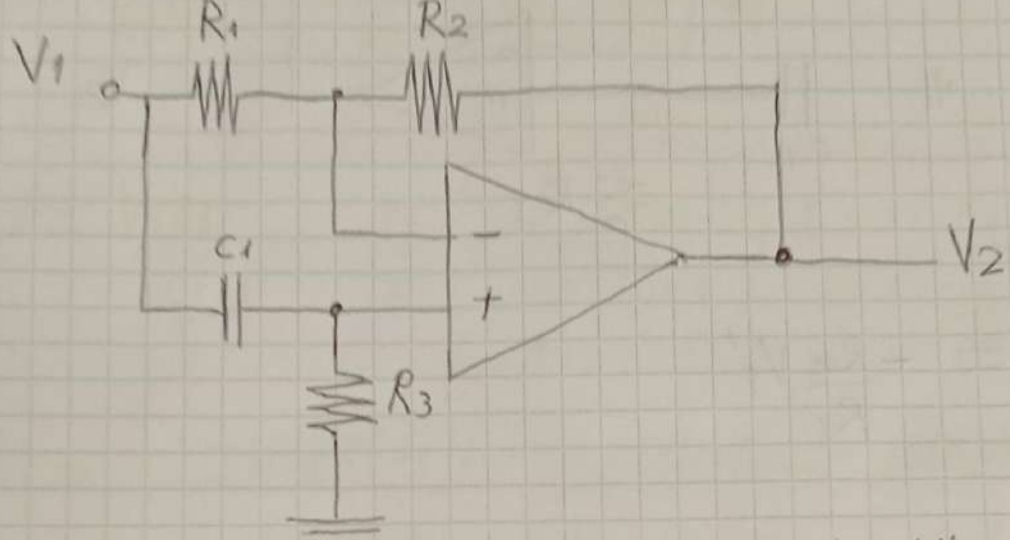
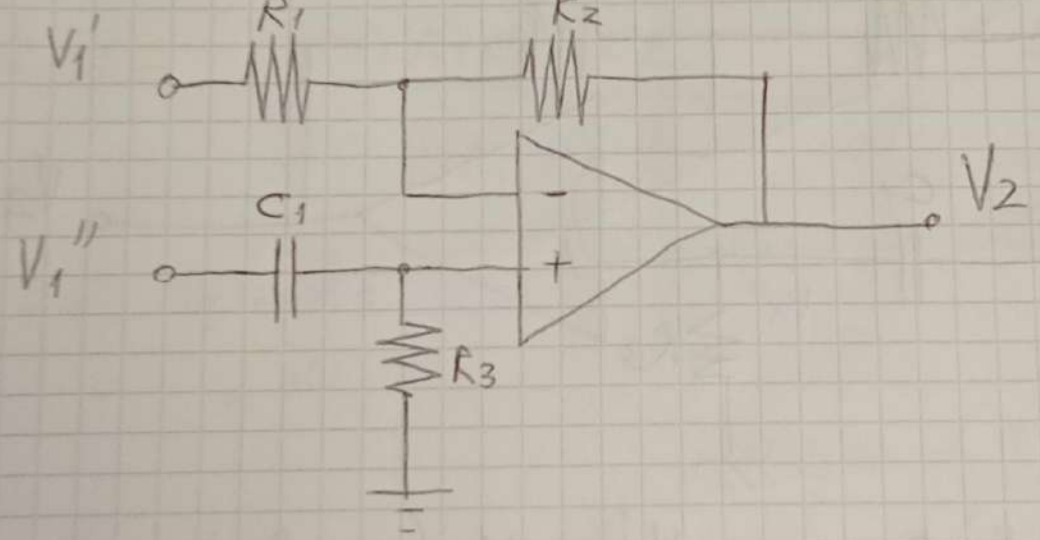
Tarea Semanal #0



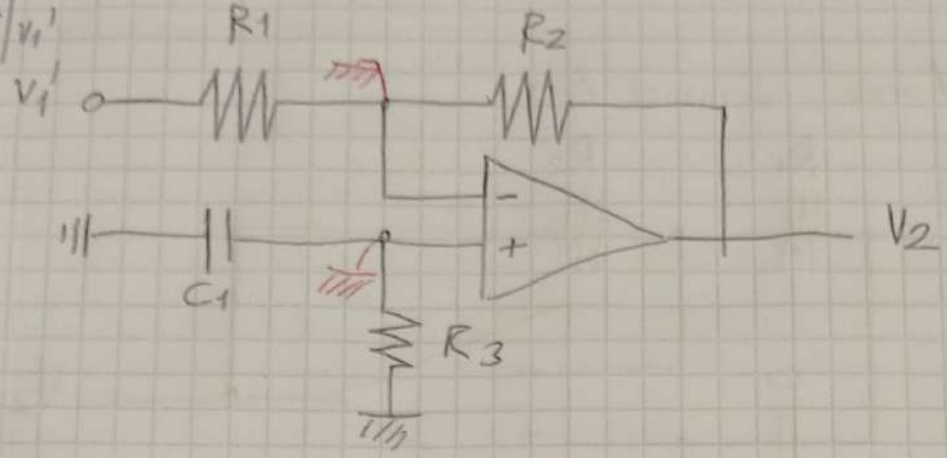
Aplico Teorema de Sustitución $(V_1' = V_1'' = V_1)$



Aplico superposición

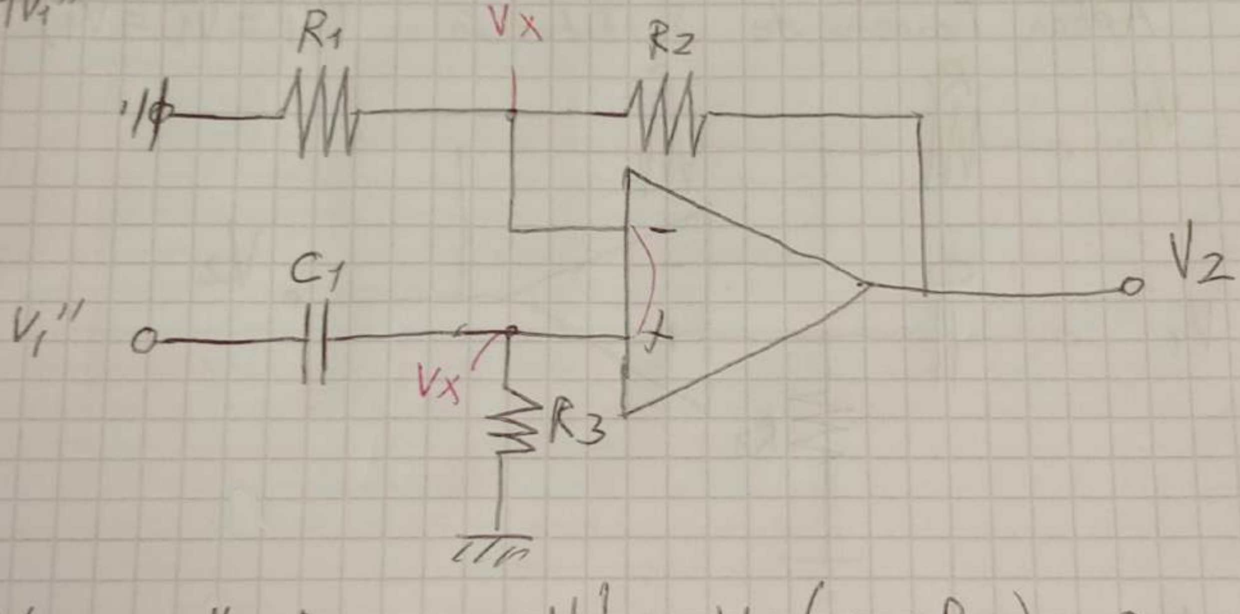
$$V_2 = V_2\Big|_{V_1'} + V_2\Big|_{V_1''}$$

$V_2\big|_{V_1'}$



$$V_2\big|_{V_1'} = -\frac{R_2}{R_1} V_1'$$

$V_2\big|_{V_1''}$



$$V_x = \frac{V_1'' \cdot R_3}{R_3 + \frac{1}{sC_1}} \quad (1) \qquad V_2\big|_{V_1''} = V_x\left(1 + \frac{R_2}{R_1}\right) \quad (2)$$

(1) e (2)

$$V_2\big|_{V_1''} = \left(1 + \frac{R_2}{R_1}\right) \frac{V_1'' \cdot R_3}{R_3 + \frac{1}{sC_1}}$$

Dado que $V_1' = V_1'' = V_1$

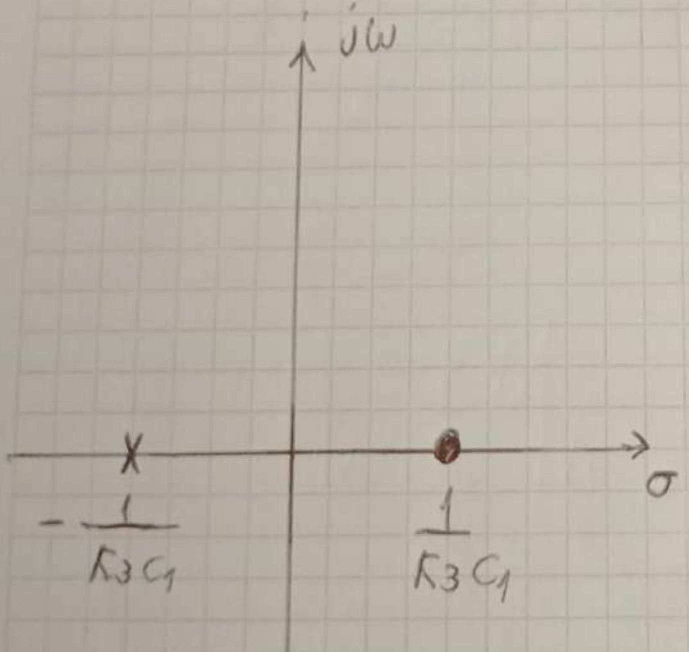
$$V_2 = -\frac{R_2}{R_1}V_1 + \frac{V_1 R_3}{R_3 + \frac{1}{sC_1}}\left(1 + \frac{R_2}{R_1}\right)$$

$$H(s) = \frac{V_2(s)}{V_1(s)} = -\frac{R_2}{R_1} + \frac{sC_1R_3}{sC_1R_3+1} + \frac{R_2\, sC_1R_3}{R_1\,(sC_1R_3+1)}$$

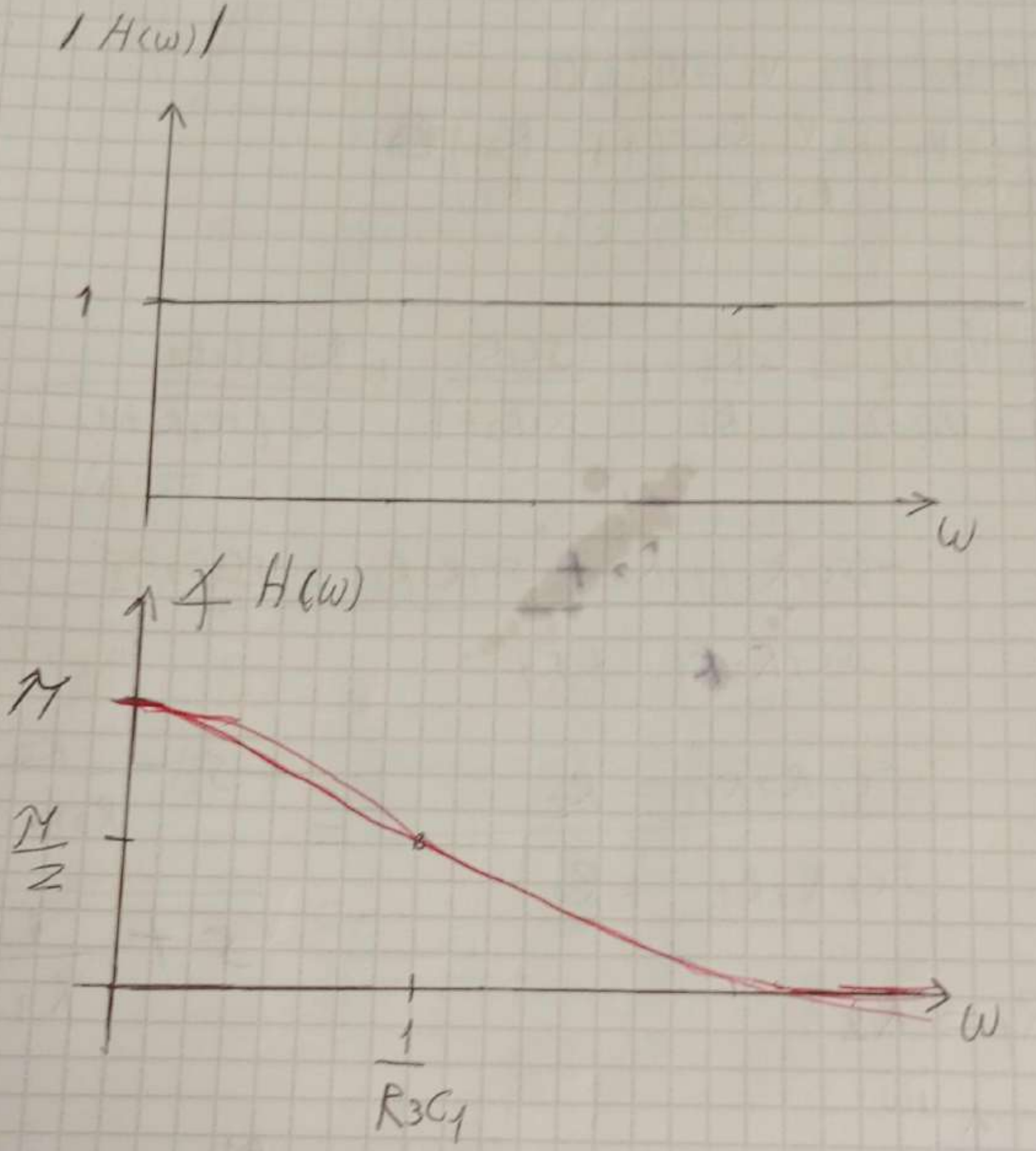
$$H(s) = \frac{-(sC_1R_3+1)R_2 + sC_1R_3R_1 + \cancel{sC_1R_3R_2}}{sC_1R_3R_1 + R_1}$$

$$H(s) = \frac{sC_1R_3R_1 - R_2}{sC_1R_3R_1 + R_1} = \frac{s - \frac{R_2}{R_3R_1C_1}}{s + \frac{1}{R_3C_1}}$$

Si $R_1 = R_2$



$$H(\omega) = \frac{-\frac{1}{R_3C_1} + j\omega}{\frac{1}{R_3C_1} + j\omega}$$



|H(ω)|
1
ω
∡ H(ω)
π
π/2
ω
1/R3C1

2)

$$H(s) = \frac{s - \frac{R_2}{R_1 R_3 C_1}}{s + \frac{1}{R_3 C_1}}$$

R_2'

C_1'

$\Omega_z = R_3$

$R_2' = \frac{R_2}{R_3}$

$R_1' = \frac{R_1}{R_3}$

$C_1' = C_1 \cdot R_3$

$$H(s) = \frac{s - \frac{R_2' \cancel{R_3}}{R_1' \cancel{R_3} \cdot C_1'}}{s + \frac{1}{C_1'}}$$

$$H(s) = \frac{s - \frac{R_2'}{R_1' C_1'}}{s + \frac{1}{C_1'}}$$

si $R_1' = R_2'$

$$H(s) = \frac{s - \frac{1}{C_1'}}{s + \frac{1}{C_1'}}$$

$\Omega_w = \omega_0 = \frac{1}{R_3 C_1} = \frac{1}{C_1'}$

$\omega_0 \$ = s$

$$H(\$) = \frac{\omega_0 \$ - \omega_0}{\omega_0 \$ + \omega_0} \Rightarrow H(\$) = \frac{\$ - 1}{\$ + 1}$$

5) El circuito es un filtro pasatodo. Y el MF-103 no utiliza la misma Red pero cuenta con un filtro de tipo peine. pero tiene varios desfasadores conectados en cascada

Bonus #1

$$H(s) = \frac{s - \frac{R_2}{R_1}\frac{1}{R_3C_1}}{s + \frac{1}{R_3C_1}}$$

$\Omega_Z = R_3$

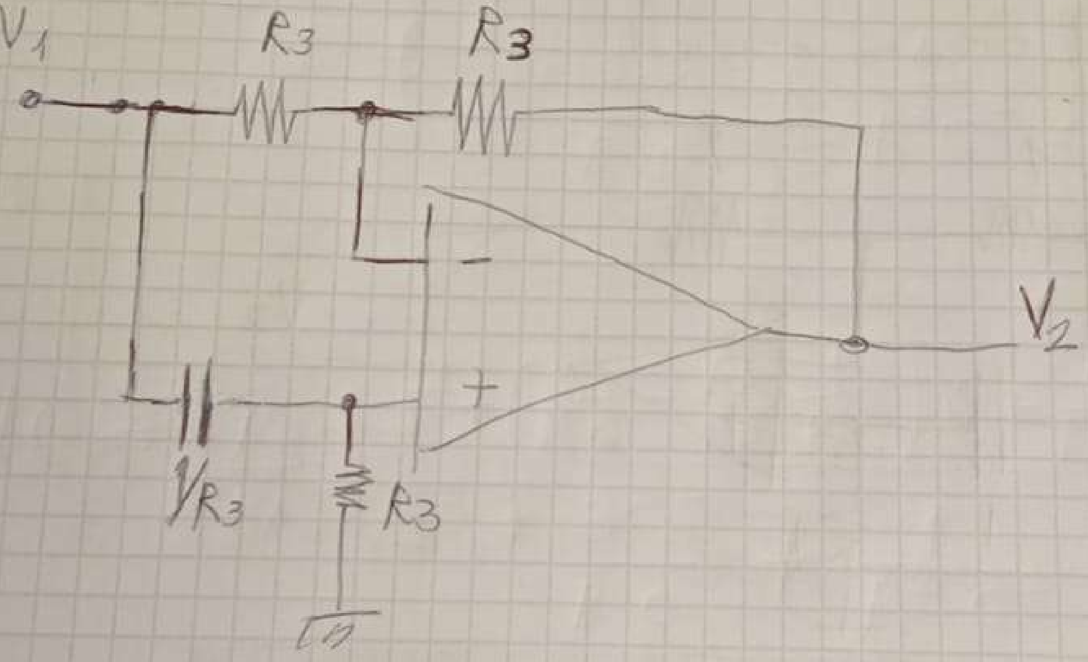
$R_2' = \frac{R_2}{R_3}$ $\quad R_3' = 1$

$R_1' = \frac{R_1}{R_3}$

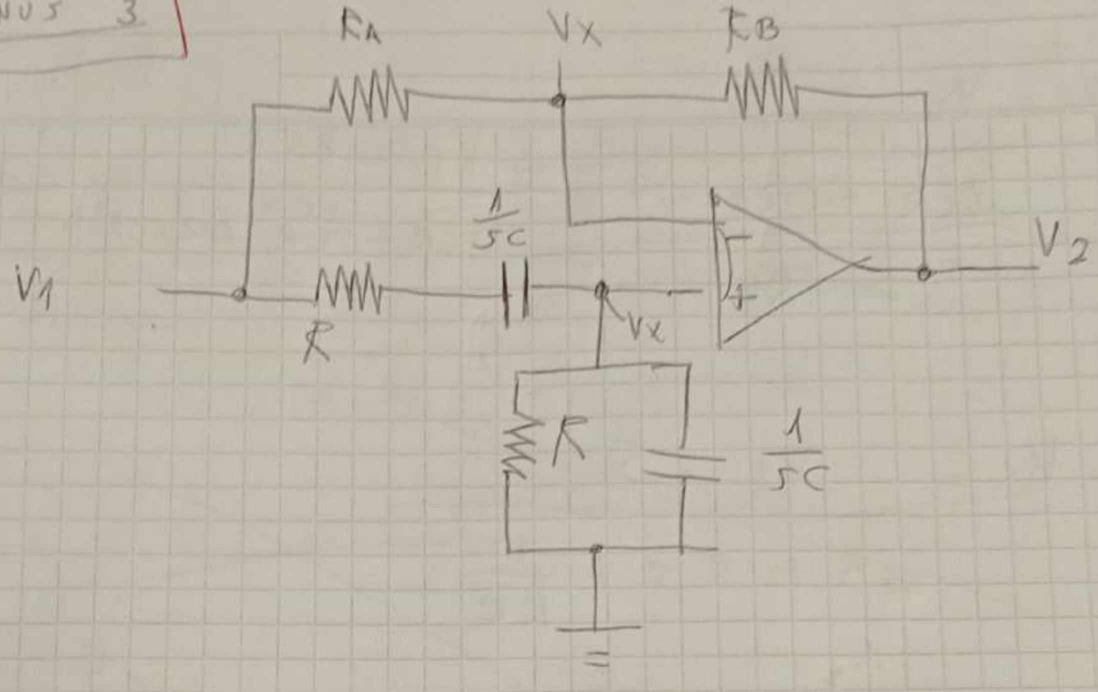
$$H(s) = \frac{s-1}{s+1}$$ $\quad R_1' = R_2'$

$C_1' = C_1 \cdot R_3$

$\Omega_W = w_0 = \frac{1}{R_3C_1} = \frac{1}{C_1'}$



BONUS 3



$$\frac{V_1 - V_x}{R_A} = \frac{V_x - V_2}{R_B} \longrightarrow V_2 = V_x\left(1 + \frac{R_B}{R_A}\right) - V_1 \frac{R_B}{R_A}$$

$$\cancel{V_2 = V_1 \frac{R_B}{R_A}}$$

$$V_x = V_1 \cdot \frac{\dfrac{\dfrac{R}{sC}}{R + \dfrac{1}{sC}}}{\dfrac{\dfrac{R}{sC}}{R + \dfrac{1}{sC}} + R + \dfrac{1}{sC}} = \frac{V_1 \cdot \dfrac{R}{sCR + 1}}{\dfrac{R}{sCR+1} + \dfrac{sCR+1}{sC}}$$

BONUS #3

$$\left(1+\frac{R_B}{R_A}\right) = \frac{6}{5}$$

$$V_x = \frac{V_1 \cdot \frac{R}{sCR+1}}{\frac{sCR}{\cancel{sCR+1}} + \frac{(sCR+1)^2}{sC\cancel{(sCR+1)}}} = \frac{V_1 \cdot sCR}{s^2C^2R^2 + 3sCR + 1}$$

$$V_x = V_1 \cdot \frac{\frac{s}{RC}}{s^2 + \frac{3s}{RC} + \frac{1}{R^2C^2}}$$

$$\frac{V_2}{V_1} = \frac{\frac{6s}{5RC}}{s^2 + \frac{3s}{RC} + \frac{1}{R^2C^2}} - \frac{1}{5}$$

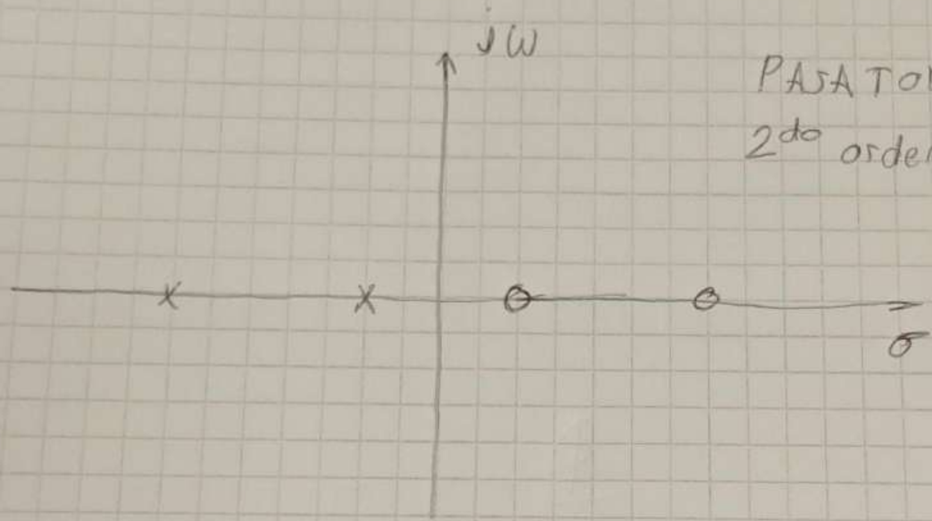
$$\frac{V_2}{V_1} = \frac{\frac{6}{5}\frac{s}{RC} - \frac{1}{5}s^2 - \frac{3}{5}\frac{s}{RC} - \frac{1}{5R^2C^2}}{s^2 + \frac{3s}{RC} + \frac{1}{R^2C^2}}$$

$$\frac{V_2}{V_1} = -\frac{\frac{1}{5}\left(s^2 - \frac{3s}{RC} + \frac{1}{R^2C^2}\right)}{s^2 + \frac{3s}{RC} + \frac{1}{R^2C^2}}$$

$$T(s) = -\frac{1}{5}\,\frac{s^2 - \frac{3s}{RC} + \frac{1}{R^2C^2}}{s^2 + \frac{3 \cdot s}{RC} + \frac{1}{R^2C^2}} = -\frac{1}{5}\,\frac{s^2 - 3000\,s + 10^6}{s^2 + 3000\,s + 10^6}$$

Ceros: 2618 381,9

Polos: −381,9 −2618



PASATODO
2^{do} orden

El primer y segundo circuito son pasatodos solo que el segundo es de mayor orden porque tiene más polos y ceros. Ademas este atenua la señal por 1/5 y en el infinito ambos circuitos tienen distinta fase.
El primero a frecuencias altas tiene una fase de 0 mientras que el segundo tiene 180° de fase