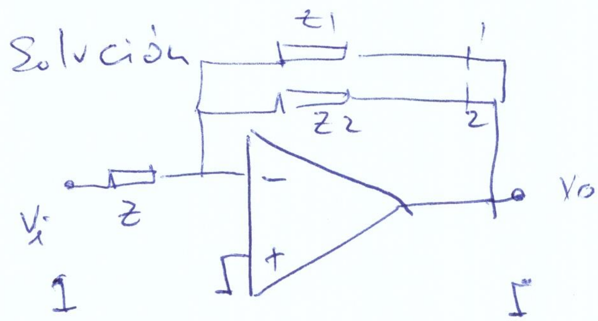
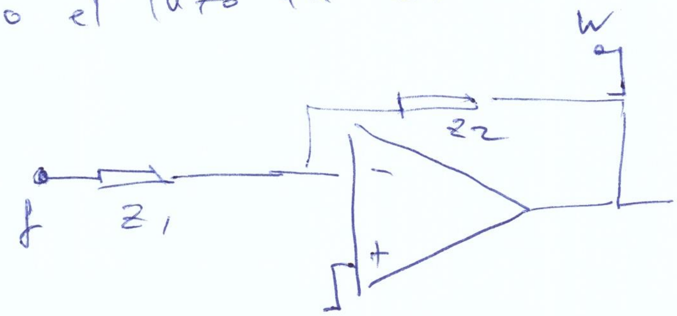
Problema 3. Solución



a. abro el lazo en 1:



$$G_{ol_1} = \frac{W(s)}{F(s)} = -\frac{Z_2(s)}{Z_1(s)}$$

b. Caso 2: $G_{ol_2} = -\dfrac{Z_1(s)}{Z_2(s)}$.

c. $1 + A\beta_1 = 1 - G_{ol_1} = 1 + \dfrac{Z_2}{Z_1}$

$1 + A\beta_2 = 1 - G_{ol_2} = 1 + \dfrac{Z_1}{Z_2}$

$\{\text{ceros de } 1 + A\beta_1\} = \{\text{ceros de } 1 + A\beta_2\} = \{\text{ceros de } Z_1(s) + Z_2(s)\}$

d $Z_1 = \dfrac{R + 1/cs}{\cancel{R + 1/cs}} = \dfrac{1 + RCs}{cs} = \dfrac{1 + Ts}{cs}$

$Z_2 = \dfrac{RLs}{R + Ls} = \dfrac{Ls}{1 + \frac{L}{R}s} = \dfrac{Ls}{1 + Ts}$

d. (cont).

$$L_1 = -G_{ol1} = +\frac{Z_2(s)}{Z_1(s)} = \frac{LCs^2}{(1+Ts)^2}$$

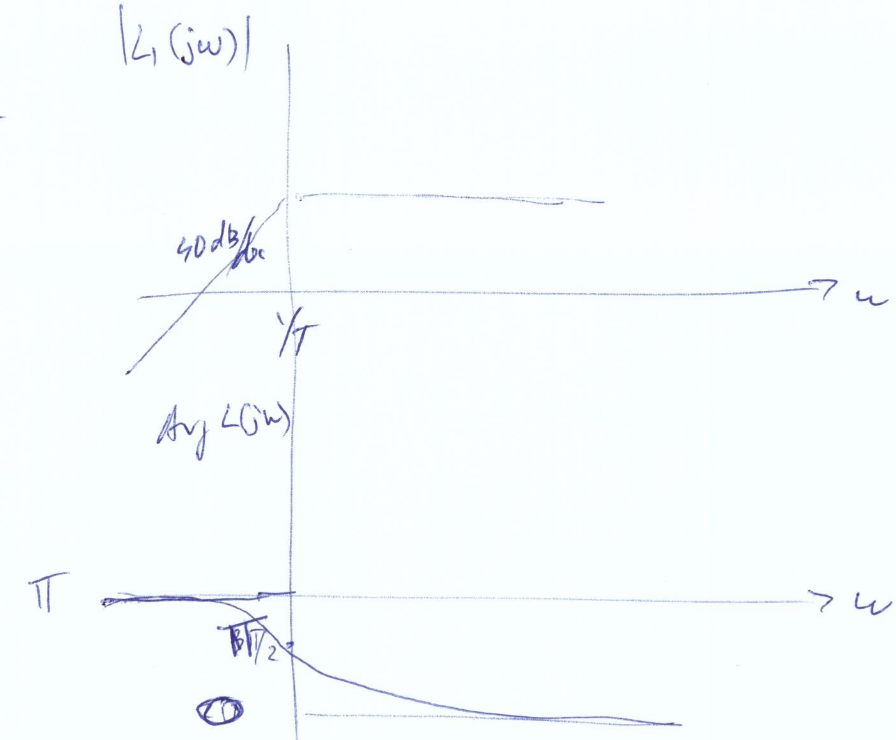
$$L_2 = -G_{ol2} = \frac{Z_1(s)}{Z_2(s)} = \frac{(1+Ts)^2}{LCs^2}$$

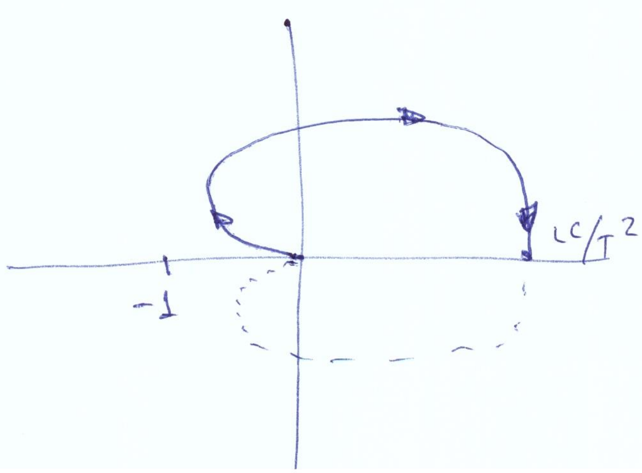
$$\lim_{s\to\infty} L_1(s) = \frac{LC}{T^2} \neq -1$$

⇒ ambas bien planteados.

$$\lim_{s\to\infty} L_2(s) = \frac{T^2}{LC} \neq -1$$

e. $L_1(s) = \dfrac{LCs^2}{(1+Ts)^2}$





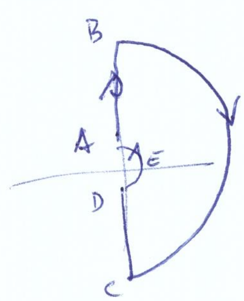
$$L_1(j\infty) = \frac{LC}{T^2}$$

$N=0$. Como $P=0$

$\Rightarrow Z=0$

f. $L_2(s) = \frac{(1+Ts)^2}{LCs^2}$

Polo doble en el origen

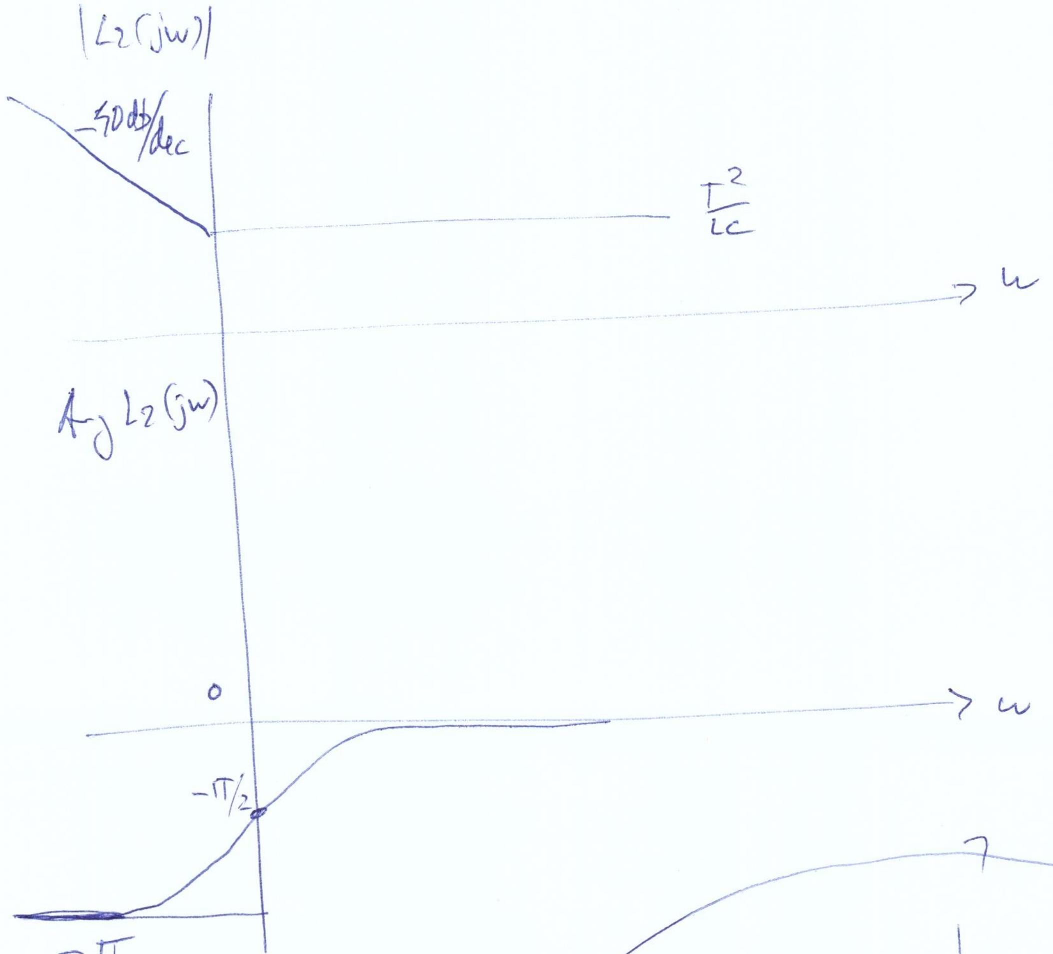


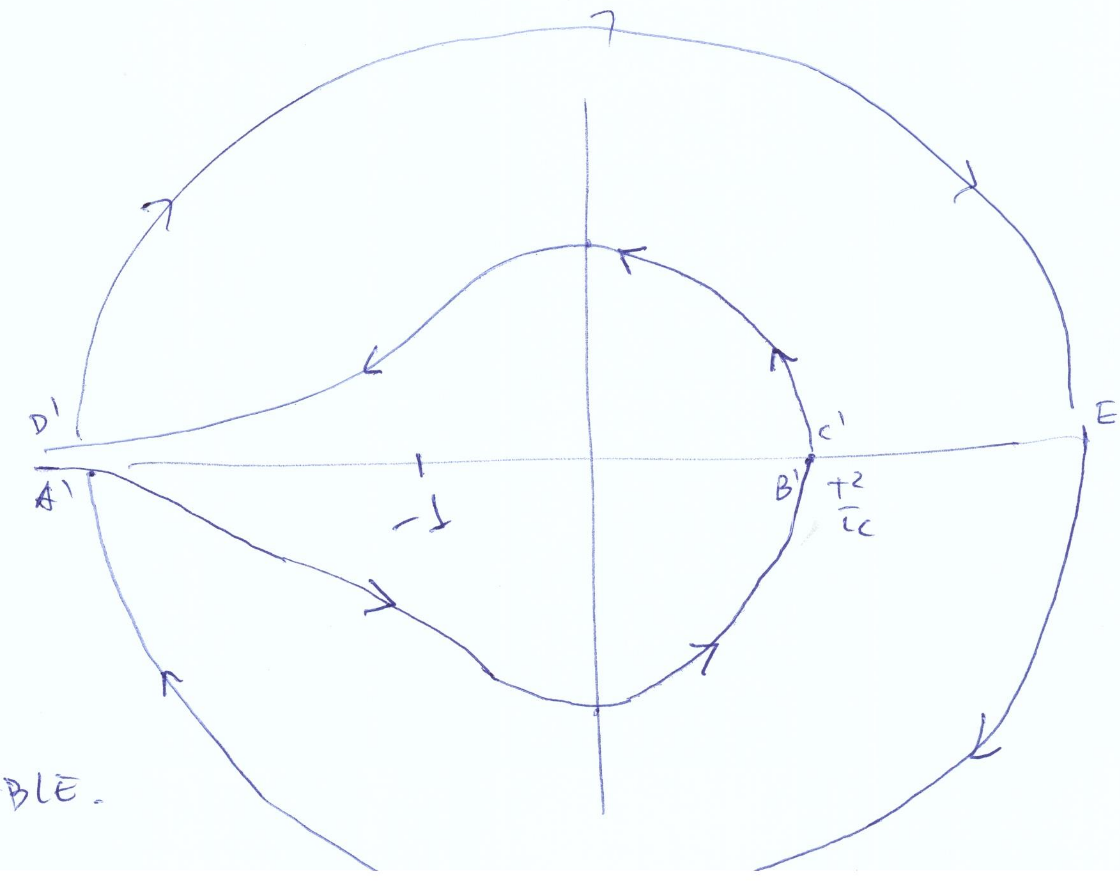
Arco E-A

$s^* = re^{j\theta} \quad \theta \in [0, \pi/2]$

$$L(s^*) = \frac{1}{LCr^2} e^{-2j\theta}$$

$r \to 0$





$N = 0$

como $P = 0$

$\Rightarrow$ BIBO ESTABLE.