9.5) a) $\frac{1}{s+1} + \frac{1}{s+3} = \frac{2s+4}{(s+1)(s+3)}$

$2s+4=0 \rightarrow s=-2$

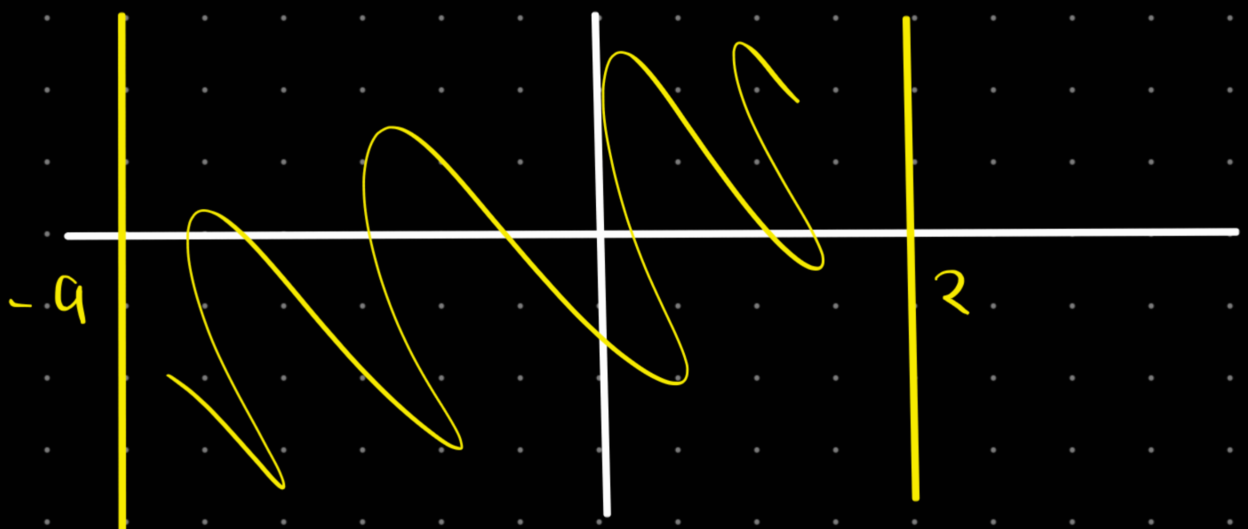
El grado del Num es menor que el den $\rightarrow$ $s=\infty$ es un cero

b) $\frac{\cancel{s+1}}{(\cancel{s+1})(s-1)} = \frac{1}{s-1}$ un cero al ∞

c) $s-1 \rightarrow$ cero en $s=1$

9.6) Tiene polo en $s=2 \rightarrow$ ROC limitada

Es abs integrable $\rightarrow$ incluye a $j\omega$



a) No, debe ser ROC todo el plano

b) Sí, debe

c) No, debe incluir $j\omega$

d) Sí,

9.9) $X(s) = \frac{2(s+2)}{(s+3)(s+4)} = \frac{A}{s+3} + \frac{B}{s+4}$

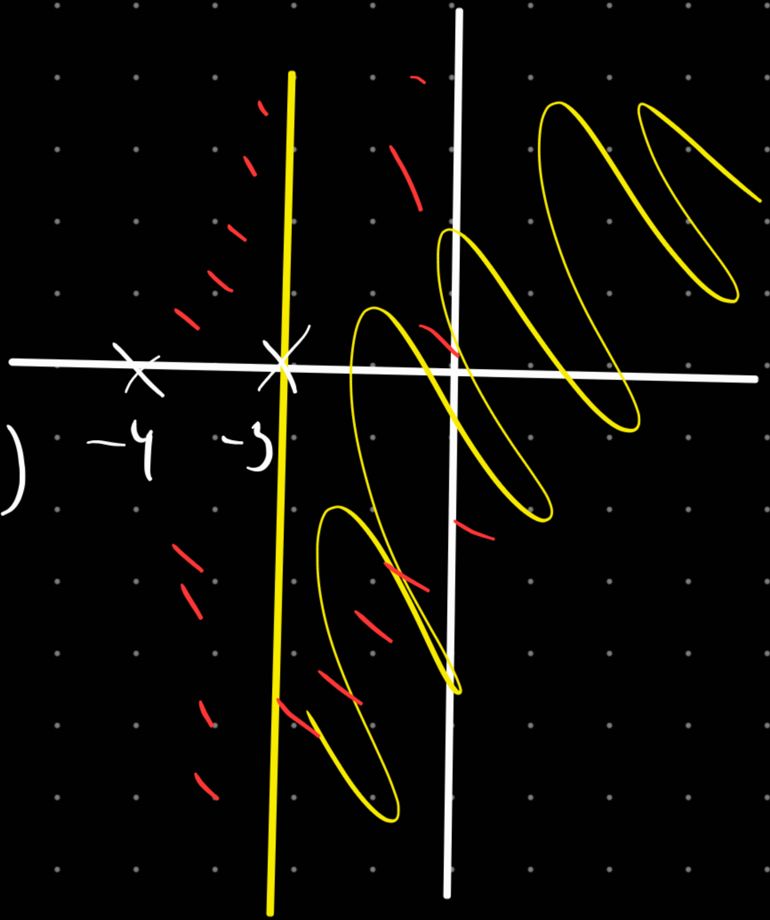
$$\left.\frac{2(s+2)\cancel{(s+3)}}{\cancel{(s+3)}(s+4)}\right|_{s \to -3} = -2$$

$$\left.\frac{2(s+2)\cancel{(s+4)}}{\cancel{(s+4)}(s+3)}\right|_{s \to -4} = 4$$

$$\frac{-2}{s+3} + \frac{4}{s+4}$$

tiene que ser $Re\{s\} > -4$

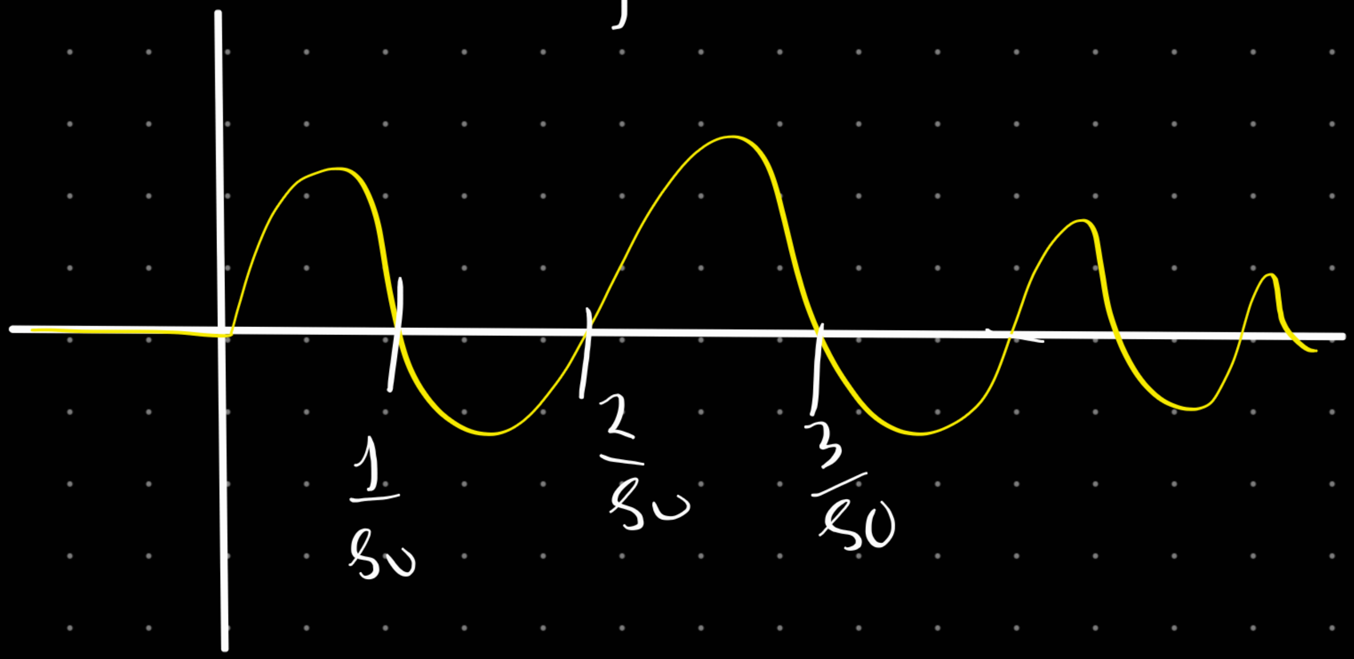
$$\left[-2e^{-3t} + 4e^{-4t}\right]u(t)$$



4.12) $x(t) = 0$ para $t<0$

$\hookrightarrow x(t) = f(t)\,u(t)$

$x(k/80) = 0 \quad k = [1; \infty\rangle$

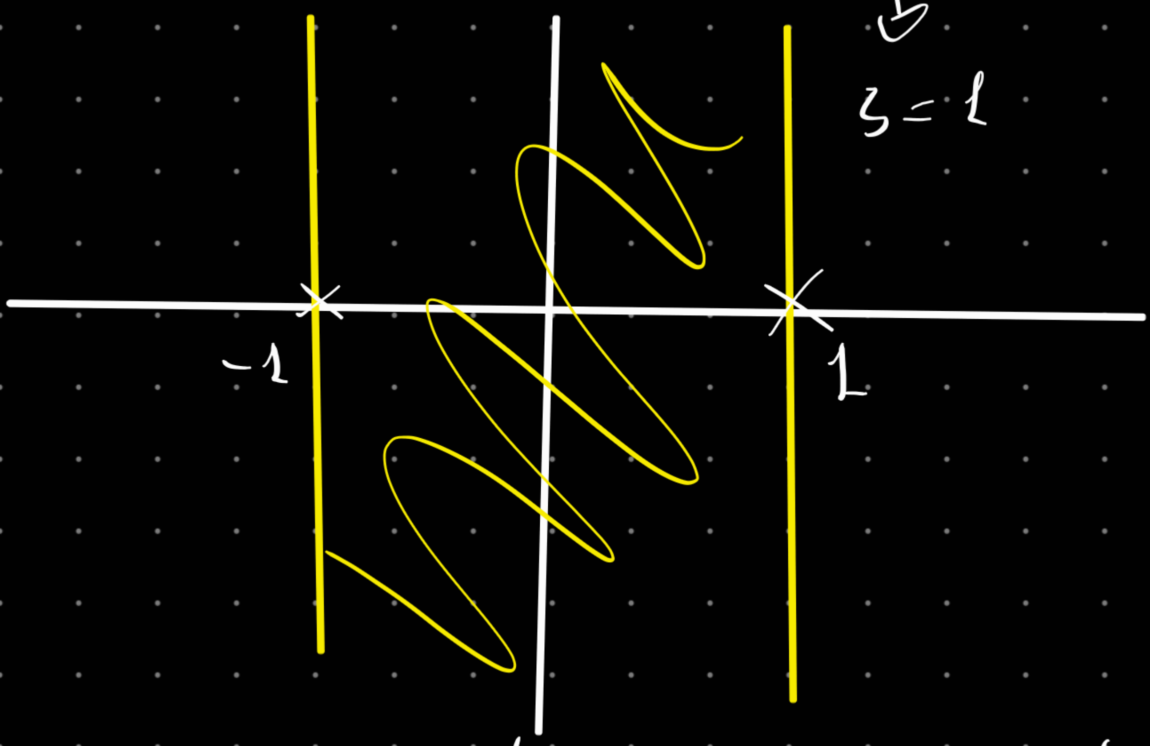


Si es senoidal o senoidal atenuada debe tener 2 polos

9.13)

$$G(s) = \frac{s}{s^2+1} = \frac{1}{2}\frac{1}{s-1} + \frac{1}{2}\frac{1}{s+1}$$

$s = 1$ $\qquad$ $s = -1$



$$g(t) = \frac{1}{2}e^{-t}u(t) - \frac{1}{2}e^{-t}u(-t)$$

$\beta = \frac{1}{2}$ $\qquad$ $\alpha = -1$

9.14)

$$X(s) = \frac{A}{(s-a)(s-b)(s-c)(s-d)}$$

$$s = \frac{1}{2} e^{\frac{i\pi}{4}}$$

$$X(s) = \frac{A}{\left(s-\frac{1}{2}e^{\frac{i\pi}{4}}\right)\left(s-\frac{1}{2}e^{-\frac{i\pi}{4}}\right)\left(s+\frac{1}{2}e^{\frac{i\pi}{4}}\right)\left(s+\frac{1}{2}e^{-\frac{i\pi}{4}}\right)} = \frac{16}{16s^2+1}$$

$$\int_{-\infty}^{\infty} x(t)\,dt = 4 = X(0) = 4$$

$$X(s) = \frac{16A}{16s^2+1} \rightarrow \frac{16A}{1} = 4 \rightarrow A = \frac{1}{4}$$

9.21)

d) $x(t) = t\,e^{-2|t|}$

$$x(t) = -1\left(-t\,e^{-(-2)t}u(-t)\right) + t\,e^{-2t}u(t)$$

$$-\frac{1}{(s-2)^2} + \frac{1}{(s+2)^2} \quad -2 < Re\{s\} < 2$$

$\hookrightarrow s < 2$ $\qquad$ $\hookrightarrow s > -2$

$$-\frac{8s}{(s-2)^2(s+2)^2}$$

Ceros $\begin{cases} s = 0 \\ s \to \infty \end{cases}$

Polos $\begin{cases} s = -2 & \times 2 \\ s = 2 & \times 2 \end{cases}$

e)

$$x(t) = -t\,e^{+2t}u(-t) + t\,e^{-2t}u(t)$$

j) $x(t) = \delta(3t) + u(3t)$ $\to u(t) = u(3t)$

$\hookrightarrow \delta(3t) = \delta(t)$

$$X(s) = 1 + \frac{1}{s} \longrightarrow Re\{s\} > 0$$

$\hookrightarrow Re\{s\} \in \mathbb{R}$ $\cap$

$\to Re\{s\} > 0$

9.22)

e) $\frac{s+1}{s^2+5s+6} = -\frac{1}{s+2} + \frac{2}{s+3}$ $-3<\Re\{s\}<-2$

$\Re\{s\}<-2$ $\Re\{s\}>-3$

$\mathcal{L}^{-1}$

$e^{-2t}u(-t) + 2e^{-3t}u(t)$

9.23)

Siendo $ROC_{x(t)} = R$

1) $x(t)e^{-3t} \overset{\mathcal{L}}{\longleftrightarrow} X(s+3)$

Debe incluir a $j\omega$ en su ROC

R desplazado 3 unidades

2) $x(t) * e^{-t}u(t) \overset{\mathcal{L}}{\longleftrightarrow} X(s) \cdot \frac{1}{s+1}$

Con un polo en

$R \cap (Re\{s\} > -1)$ $s = -1$

3) $x(t) = 0 \quad t > 1 \rightarrow R \in L.D.$

4) $x(t) = 0 \quad t < -1 \quad R \in L.I.$

9.26)

$$y(t) = x_1(t-2) * x_2(-t+3)$$

$$= x_1(t)\Big|_{t \to t-2} * x_2(-t)\Big|_{t \to t-3}$$

$$Y(s) = e^{-2s} X_1(s) \cdot e^{-3s} X_2(-s)$$

$$= e^{-5s} \frac{1}{s-2} \cdot \frac{1}{s-3}$$

$$Y(s) = -\frac{e^{-5s}}{s-2} + \frac{e^{-5s}}{s-3} \quad Re\{s\} > -2$$

$$y(t) = \left[-e^{-2(t-5)} + e^{-3(t-5)}\right] u(t-5)$$

9.27)

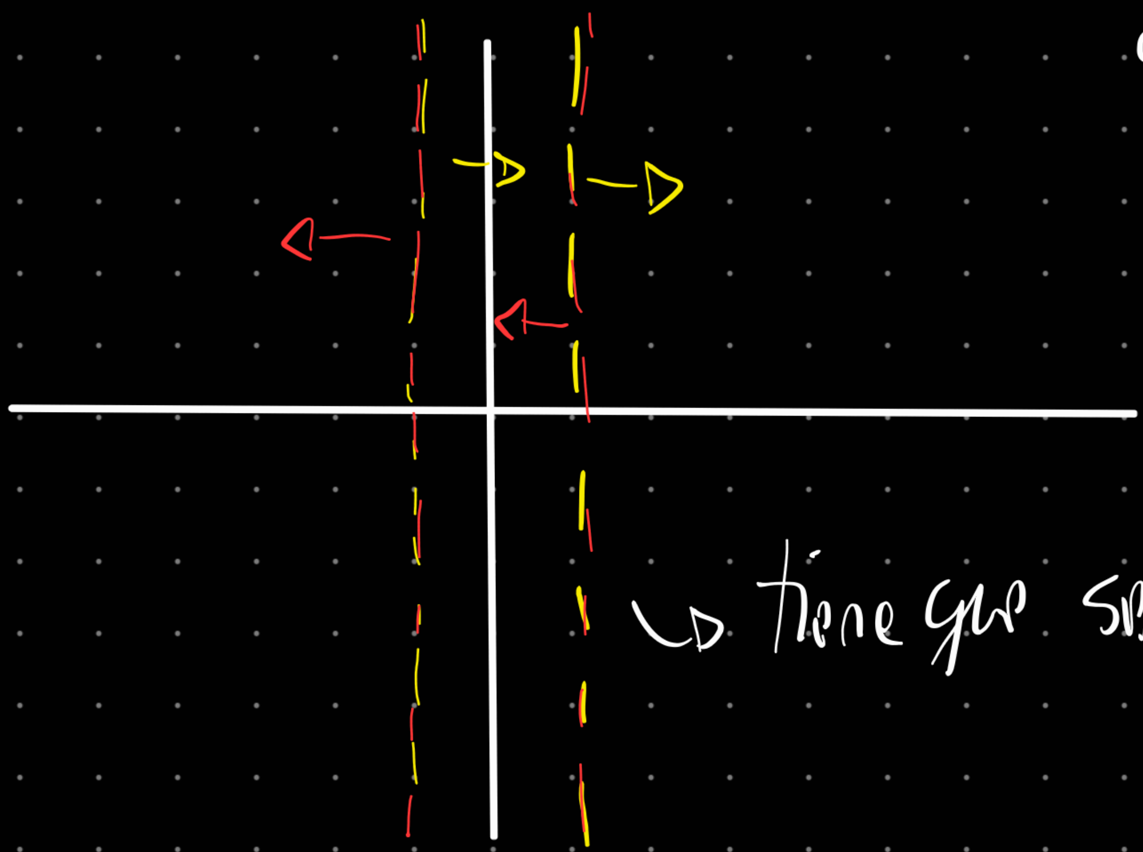
1) $X(s) = \dfrac{A}{(s+1+j)(s+1-j)}$

$$ROC = R_x = \begin{cases} \Re\{s\} > -1 \;\cap \\ \Re\{s\} < -1 \end{cases}$$

$$X(s) = \frac{A}{s^2+2s+2}$$

$$8 = \frac{A}{0^2+2\cdot 0+2} \rightarrow A = 16$$

$e^{2t}x(t) \longleftrightarrow X(s-2) \rightarrow R_x$ desplazada 2 unidades a la derecha



↳ tiene que ser $\Re\{s\} > -1$

9.33)

$$\overset{a=-1}{} \qquad \overset{a=1}{}$$

$$x(t) = -1\left[-1\, e^{-1\cdot 1\, t}\, u(-t)\right] + e^{-t} u(t)$$

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

$\hookrightarrow -1 < \operatorname{Re}\{s\} < 1$

$$Y(s) = H(s)\, X(s)$$

$$Y(s) = -\frac{2}{s^3+s^2-2} =$$

$\rightarrow \operatorname{Re}\{s\} \in \langle -1, 1\rangle$

$$= -\frac{2}{5}\frac{1}{s-1} + \underbrace{\frac{1}{1-2i}\frac{1}{s+(1+i)} - \frac{i}{2-i}\frac{1}{s+(1-i)}}_{\dfrac{2s+6}{5s^2+10s+10}}$$

$$\frac{2}{5}\left(\frac{s+3}{(s^2+2s+1)+1}\right)$$

$$-\frac{2}{5}\frac{1}{s-1} \quad \frac{2}{5}\frac{s+1}{(s+1)^2+1} + \frac{4}{5}\frac{1}{(s+1)^2+1}$$

$$-\frac{2}{5}e^{t}u(-t)+u(t)e^{-t}\left(\frac{2}{5}\cos t+\frac{4}{5}\sin t\right)$$