# Tarea 1: Sistemas de primer orden

Encontrar la respuesta al escalón unitario $y(t)$ del siguiente sistema de primer orden:

$$H(s) = \frac{\tau s}{\tau s + 1} \quad \text{donde } \tau = CR \text{ y } x(t) \text{ es un escalon unitario}$$

$$H(s) = \frac{Y(s)}{X(s)} \rightarrow Y(s) = H(s)\,X(s)$$

$$Y(s) = \frac{\tau s}{\tau s + 1} X(s) = \frac{1}{s} \therefore Y(s) = \left(\frac{\tau s}{\tau s + 1}\right)\frac{1}{s} = \frac{\tau}{\tau s + 1} = \frac{A}{\tau s + 1}$$

$$Y(s) = (\tau s + 1)\left(\frac{\tau}{\tau s + 1}\right) = (\tau s + 1)\left(\frac{A}{\tau s + 1}\right)$$

$$\tau = A$$

Despejamos $A$

$$Y(s) = \frac{\tau}{\tau s + 1} \rightarrow y(t) = \mathcal{L}^{-1}\{Y(s)\} = \mathcal{L}^{-1}\left\{\frac{\tau}{\tau s + 1}\right\}$$

$$y(t) = \mathcal{L}^{-1}\left\{\frac{\tau}{\tau\left(s + \frac{1}{\tau}\right)}\right\} = \mathcal{L}^{-1}\left\{\frac{1}{s + \frac{1}{\tau}}\right\} \rightarrow \alpha = \frac{1}{\tau}$$

$$\mathcal{L}\{e^{-\alpha t}\} = \frac{1}{s + \alpha}$$

$$y(t) = e^{-\frac{t}{\tau}}$$