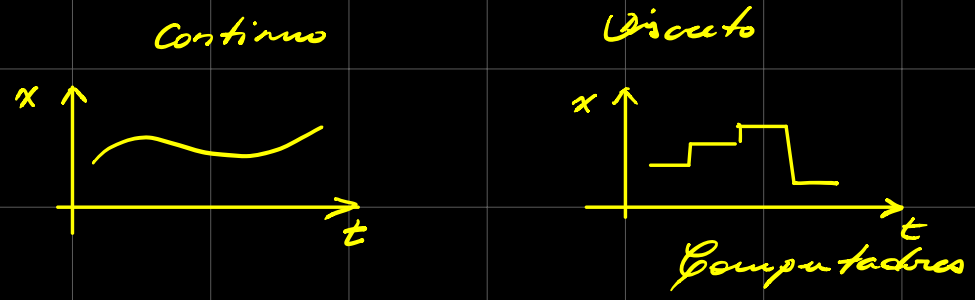
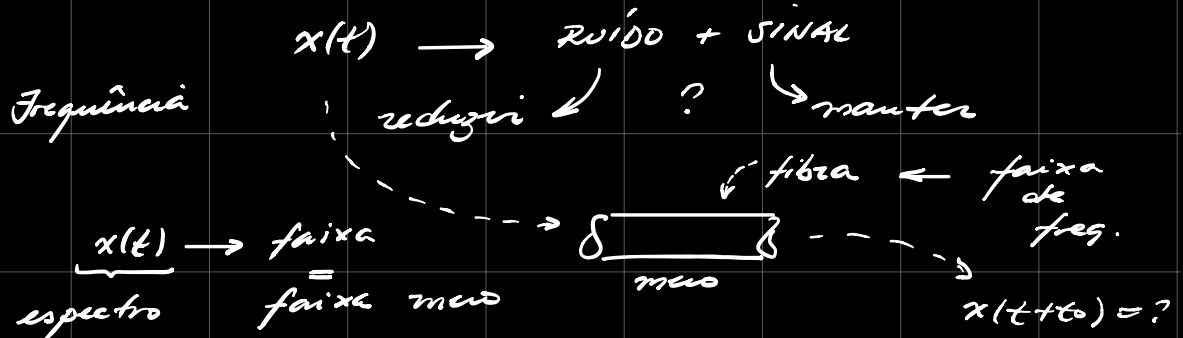
SINAIS e SISTEMAS

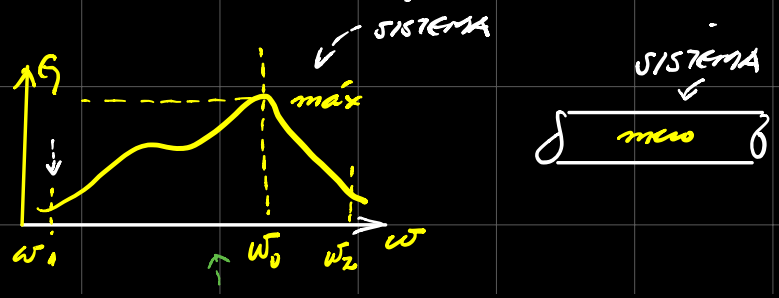
sinal ⟶ $x(t)$ ⟶ série temporal

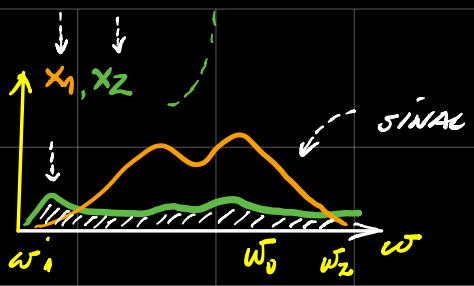
Classificar o sinal





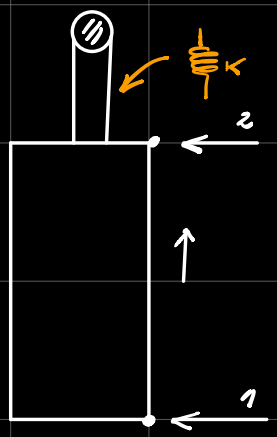
$$x(t) \overset{\mathcal{F}}{\longleftrightarrow} X(\omega)$$

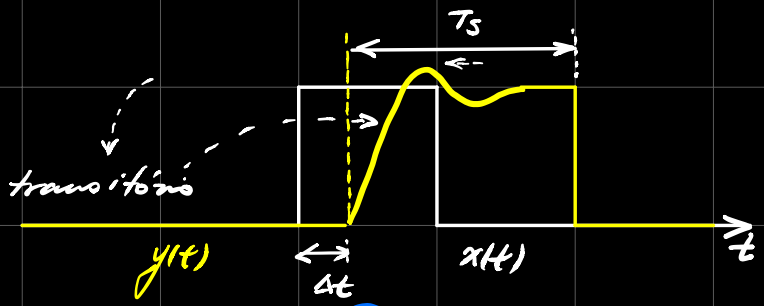


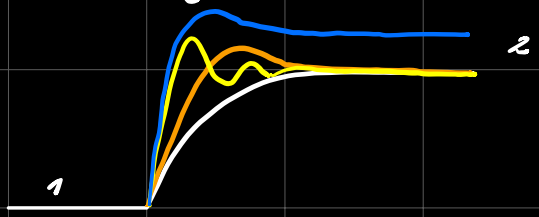


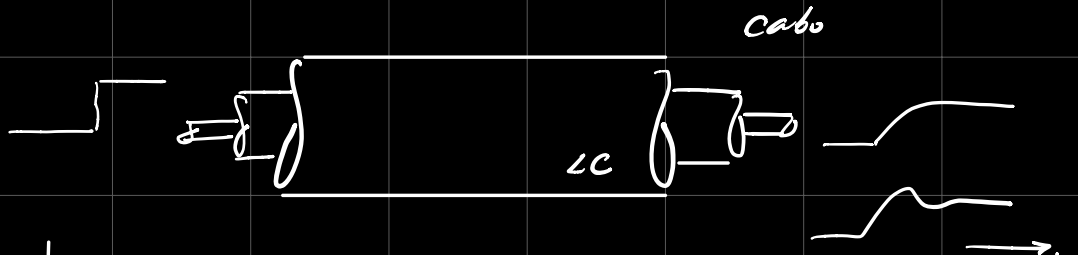
Série e transformada de Fourier

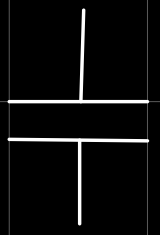
dinâmica

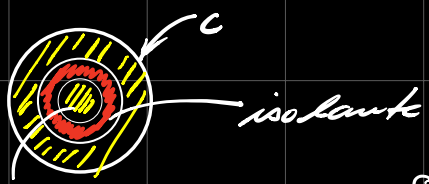


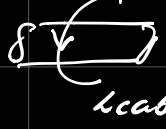


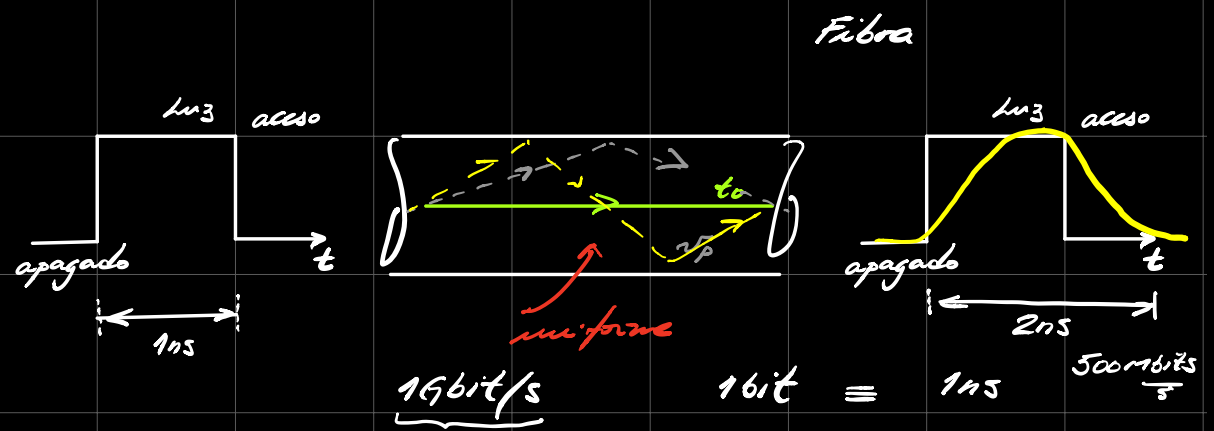








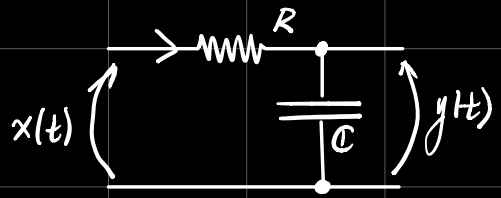




1Gbit/s 1bit ≡ 1ns 500 mbits/s

$x(t) \longleftrightarrow X(s)$

Laplace : transitórios



$y(t_1) = 2$ ✓
$y(t_2) = 4$ ✓
$y(t_3) = 0$ ✓
$y(t_4) = -20$ ✓

tempo :

$x(t) = v_R(t) + y(t)$

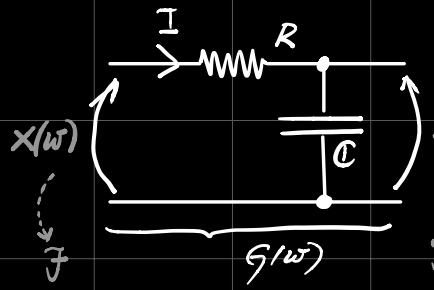
$i_c(t) = C \frac{dy(t)}{dt}$

$x(t) = R.C \frac{dy(t)}{dt} + y(t)$

$RC\,\dot{y}(t) + y(t) = x(t)$ ← modelo do circuito

derivadas ⟹ $\boxed{\dot{y}(t) = -\frac{1}{RC} y(t) + x(t)}$ ⟹ SW

$y'(t) > 0 \longrightarrow \uparrow \qquad y'(t) < 0 \longrightarrow \downarrow \qquad y'(t) = 0$ estável



$$y'(t) = -\frac{1}{RC}\,y(t) + x(t)$$

$$y(w) = \frac{1/jwC}{R + 1/jwC}\,x(w)\,I$$

$R \qquad x_C = \frac{1}{wC}$

$Z_C \qquad Z_C = \frac{1}{jwC}$

$$y(w)/x(w) = \frac{1}{jwRC + 1} = G(w) \longleftarrow$$

$$\underbrace{y(w)}_{\text{sinal}} = G(w) \cdot \underbrace{x(w)}_{\text{sinal}} \longleftarrow \text{sistema}$$

$$G(w) = \frac{1}{jwRC + 1}$$

$w = 0 \longrightarrow \text{DC} \longrightarrow$ médio

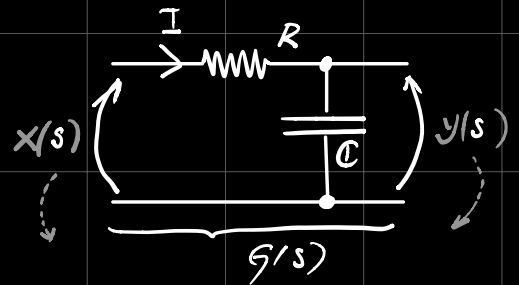
$$G(w=0) = \frac{1}{j \cdot 0 \cdot RC + 1} = 1$$

$$G(w = 1/RC) = \frac{1}{j\frac{1}{RC} \cdot RC + 1} = \underbrace{\frac{1}{j+1}}$$

$$G(w) = \frac{1 \angle 0}{\sqrt{2} \angle 45^\circ} = \underbrace{1/\sqrt{2}}_{0.707}\ \underbrace{\angle -45^\circ}_{\text{atraso}}$$

$$y(w) = \underbrace{0.707 \angle -45}_{} \cdot x(w)$$

$$\longrightarrow \quad \underbrace{y(w)}_{} = 0.707\, |x(w)| \angle \theta_{x(w)} - 45°$$



$$\dot{y}(t) = -\frac{1}{RC}\, y(t) + x(t)$$

$$s = \sigma + j\omega$$

$$y(s) = \frac{1/sC \cdot x(s)}{R + 1/sC} = \frac{1}{sRC + 1} \cdot x(s)$$

$$y(s)/x(s) = \frac{1}{sRC + 1} = G(s)$$

$$G(s) = \frac{1/RC}{s + 1/RC}$$

transitório !

$$x(t) = \delta(t) \xrightarrow{\mathcal{L}} x(s) = 1 \quad \therefore \quad y(s) = G(s) \cdot \underbrace{x(s)}_{1}$$

$$y(s) = G(s) \cdot \frac{1/RC}{s + 1/RC} \xrightarrow{\mathcal{L}^{-1}}$$

$$y(t) = \frac{1}{RC} \cdot e^{-t/RC}$$