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Ex.S1 Response of electric circuit when impulse response and input signal are shown as follows. Sinusoidal waves input. R=1Ω,L=1 H (Series connection)

$R := 1 \qquad L := 1 \qquad Z(s) := R + s \cdot L \qquad h(t) := e^{-t}$ impulse response

$h(t) := e^{-t} \xrightarrow{laplace} \frac{1}{s+1} \qquad H(s) := \frac{1}{s+1} \qquad R := 1 \quad \omega := 1 \quad L := 1$

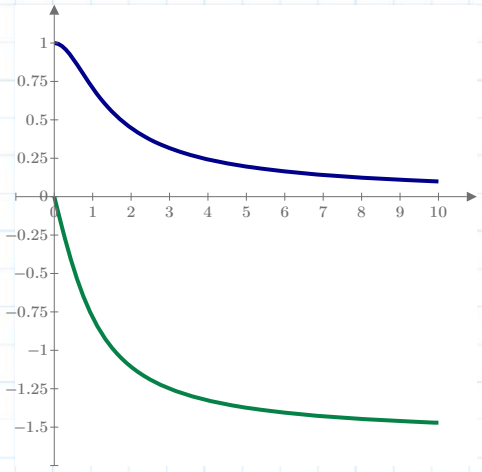
$$H(\omega) := \int_0^{\infty} e^{-1\cdot\tau} \cdot e^{-1\cdot\omega\cdot\tau\cdot 1\mathrm{i}}\, d\tau \xrightarrow{simplify} \frac{1}{1+\omega\cdot 1\mathrm{i}}$$

$$H(\omega) := \frac{1}{1+\omega\cdot 1\mathrm{i}} \qquad \omega := 0, 0.1 .. 10$$

$H(1) = 0.5 - 0.5\mathrm{i}$

$|H(1)| = 0.707$

$\arg(H(1)) = -0.785$



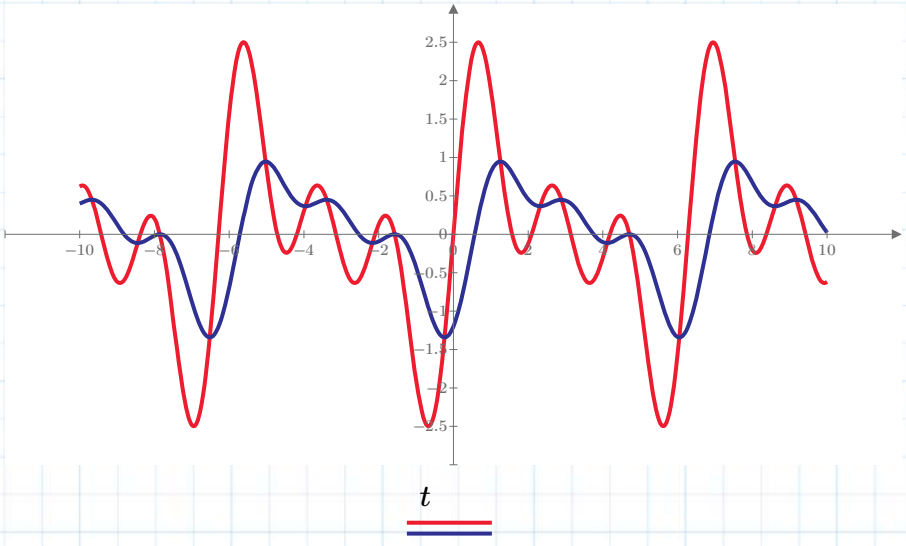
$|H(\omega)|$

$\arg(H(\omega))$

ω

$x(t) := \sin(t) + \sin(2\cdot t) + \sin(3\cdot t)$ *input_signal*

$y(t) := |H(1)|\cdot\sin(t + \arg(H(1))) + |H(2)|\cdot\sin(2\cdot t + \arg(H(2))) + |H(3)|\cdot\sin(3\cdot t + \arg(H(3)))$ *output_signal*



$x(t)$

$y(t)$

t