Le12

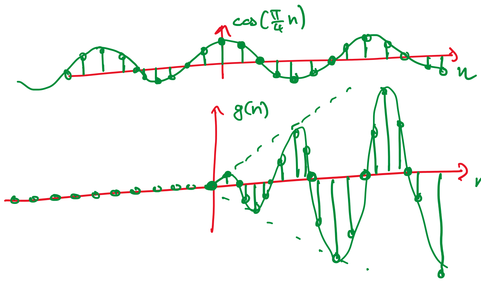
Thursday, 26 March 2026 08:32

ES1 LTI $g(n) = n\cos\left(\frac{\pi}{4}n\right) 1_0(n)$

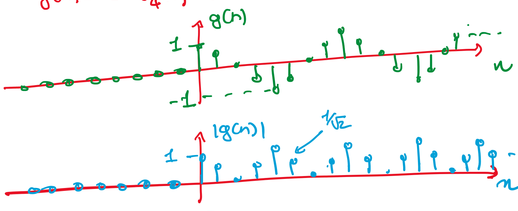
È BIBO STABILE? NO

È CAUSALE? SÌ ✗ A CAUSA DI $1_0(n)$

È REALE? SÌ



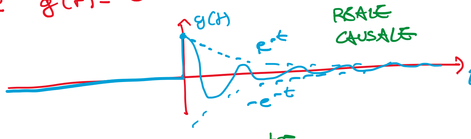
ES2 $g(n) = \cos\left(\frac{\pi}{4}n\right) 1_0(n)$ REALE E CAUSALE



$$L_g = \sum_{n=0}^{\infty} |g(n)| = \infty$$

NON BIBO STABILE

ES3 $g(t) = e^{-t}\cos(2t)\,1(t)$

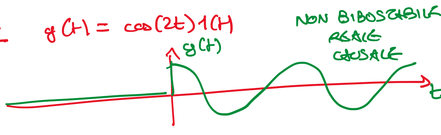


$$L_g = \int_{-\infty}^{+\infty} |g(t)|\,dt = \int_{0}^{+\infty} e^{-t}|\cos(2t)|\,dt \leq 1$$

$$\leq \int_0^{+\infty} e^{-t}\,dt = -e^{-t}\Big]_0^{+\infty} = 0 - (-1) = 1$$

BIBO STABILE

ES4 $g(t) = \cos(2t)\,1(t)$ NON BIBO STABILE, REALE, CAUSALE



ES5

$h(n) = h_1 * h_2(n)$

$x(n) = \delta(n) - a\,\delta(n-1)$

$h_1(n) = \sin(\beta n)$

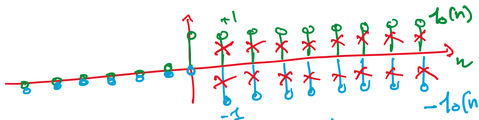
$h_2(n) = a^n 1_0(n) \quad |a| < 1$

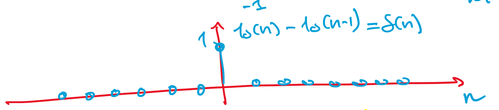
1) IL SISTEMA COMPLESSIVO È BIBO STABILE — NON BIBO STABILE ✗ INTUITIVE ✗ CASA TROVARE $h(n) = h_1 * h_2(n)$

2) TROVARE $y(n)$

$$y(n) = x * (h_1 * h_2)(n)$$
$$= (x * h_1) * h_2(n)$$
$$= (x * h_2) * h_1(n)$$

$$x * h_2(n) = [\delta(n) - a\delta(n-1)] * \underbrace{[a^n 1_0(n)]}_{h_1(n)}$$
$$= h_1(n) - a\,h_2(n-1)$$
$$= a^n 1_0(n) - a \cdot \underbrace{a^{n-1}}_{a^n} 1_0(n-1)$$
$$= a^n\left(1_0(n) - 1_0(n-1)\right)$$





$$x * h_2(n) = a^n\,\delta(n) = a^0\,\delta(n) = \delta(n)$$

$$y(n) = (x * h_2) * h_1(n) = \delta * h_1(n) = h_1(n) = \sin(\beta n)$$