Señales exponenciales LIT
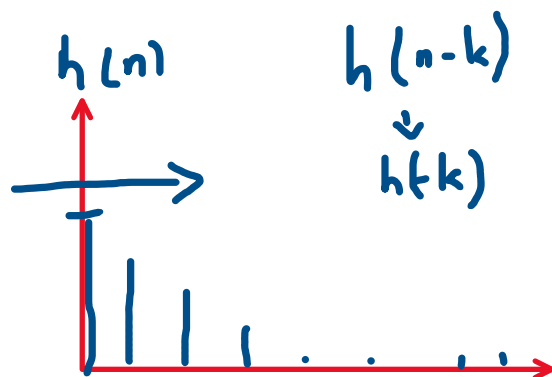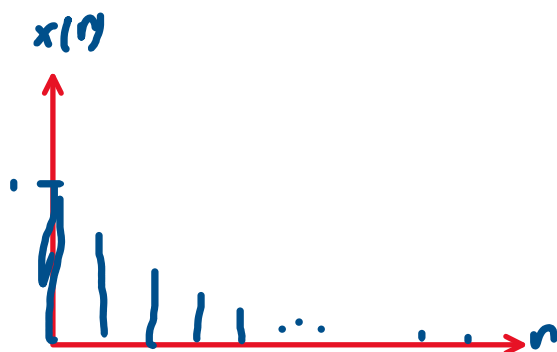
sábado, 8 de marzo de 2025   10:43 a. m.

Problema: Determine la salida y(n) del siguiente sistema LIT:

- Entrada: x(n) = (0.5)^n·u(n)
- Respuesta al impulso: h(n) = (0.3)^n·u(n)

$n \geq 0$

$h(n-k)$
$\downarrow$
$h(k)$

$$y(n) = \sum_{k=0}^{n} x(k)\, h(n-k) = \sum_{k=0}^{n} 0.5^k \, (0.3)^{n-k}$$

$$y(n) = 0.3^n \sum_{k=0}^{N} \left(\frac{0.5}{0.3}\right)^k = 0.3^n \sum_{k=0}^{n} \frac{5}{3}^k$$

$$\rightarrow S_m = \frac{1 - r^{m+1}}{1 - r}, \quad \text{para } |r| < 1$$

$$S_n = \frac{1 - \left(\frac{5}{3}\right)^{n+1}}{1 - \frac{5}{3}} = \frac{1 - \frac{5}{3}^{n+1}}{-\frac{2}{3}}$$

$$\boxed{y(n) = 0.3^n \frac{1 - \frac{5}{3}^{n+1}}{-\frac{2}{3}} = \frac{0.3^n - 0.3^n \frac{5}{3}^{n+1}}{-\frac{2}{3}}}$$

$n \geq 0$

$$y(n) = 0 \qquad n < 0$$