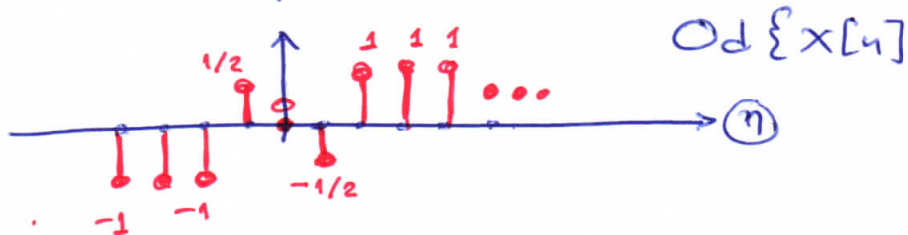
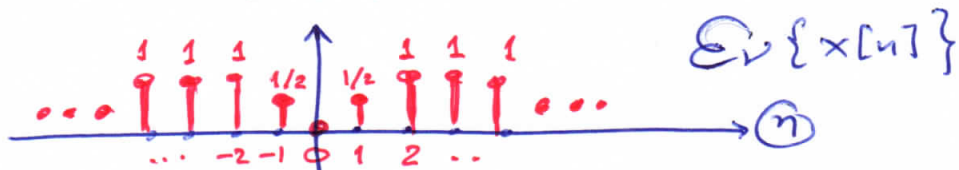
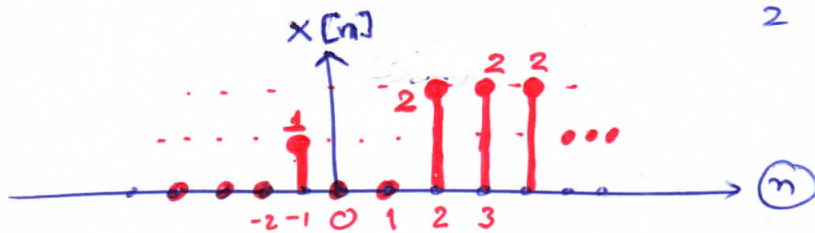


Γ1a

$$x[n] = \delta[n+1] + 2u[n-2]$$

$$\begin{aligned} \text{Ev}\{x[n]\} &= \frac{x[n] + x[-n]}{2} = \frac{\delta[n+1] + u[n-2] + \delta[-n+1] + u[-n-2]}{2} \\ \text{Od}\{x[n]\} &= \frac{x[n] - x[-n]}{2} = \frac{\delta[n+1] + u[n-2] - \delta[-n+1] - u[-n-2]}{2} \end{aligned}$$



Γ1b

$$\begin{aligned} \text{Για } N \geq 2: \quad \frac{1}{2N+1} \sum_{-N}^N |x[n]|^2 &= \frac{1}{2N+1} (1 + 2^2(N-2)) \\ &= \frac{4N-7}{2N+1} \xrightarrow{N \rightarrow \infty} 2 \end{aligned}$$

ΙΣΧΥΟΣ

POWER = 2
ENERGY = ∞

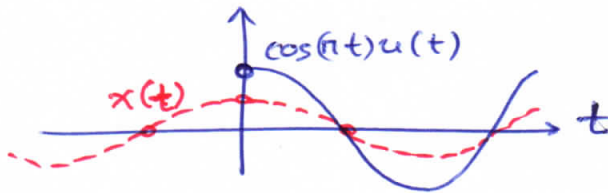
Γ1c

$$x(t) = \mathcal{E}\nu \{ \cos(\pi t) u(t) \}$$

$$\equiv \frac{1}{2} \{ \cos(\pi t) u(t) + \cos(-\pi t) u(-t) \}$$

$$= \cos(\pi t) \longrightarrow T_0 = \frac{2\pi}{\pi} = 2$$

ΠΕΡΙΟΔΙΚΟ ΜΕ ↑



Γ2α

$$y(t) = x(\cos(t))$$

ΑΙΤΙΑΤΟ

?

$$t = -\pi/2 \Rightarrow \cos(t) = 0$$

$$\text{ΑΡΑ: } y(-\pi/2) = x(0) \Rightarrow \text{ΜΗ ΑΙΤΙΑΤΟ}$$

Γ2b

$$y[n] = n x[2n]$$

ΕΥΣΤΑΘΕΣ

?

$$\text{Έστω } x[n] = u[n] \text{ (Φραγμένο)} \Rightarrow$$

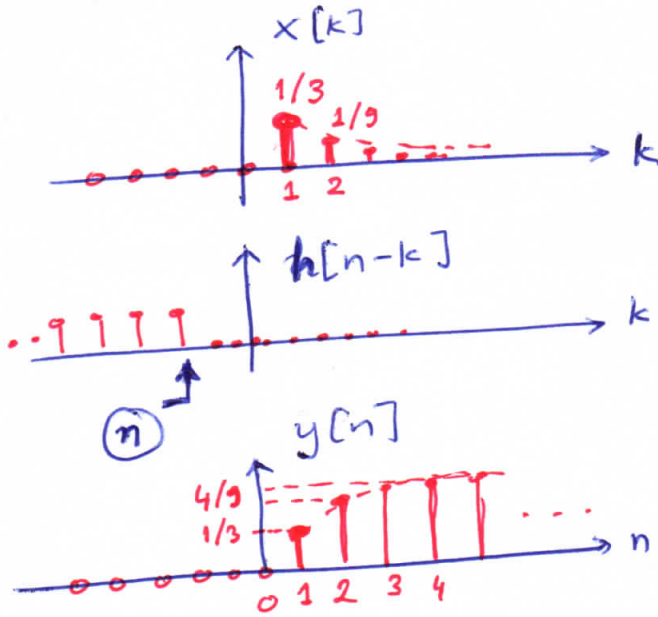
$$\Rightarrow y[n] = n u[2n] = n u[n] \text{ Μη φραγμένο}$$

Αρα ΑΣΤΑΘΕΣ !

Γ.3

$$x[n] = \left(\frac{1}{3}\right)^n u[n-1]$$

$$h[n] = u[n]$$



$$n < 1: y[n] = 0$$

$n \geq 1:$

$$y[n] = \sum_{k=1}^n \left(\frac{1}{3}\right)^k = \frac{1}{3} \sum_{k=0}^{n-1} \left(\frac{1}{3}\right)^k$$

$$= \frac{1}{3} \frac{1 - \left(\frac{1}{3}\right)^n}{1 - \frac{1}{3}} =$$

$$= \frac{1}{2} \left[1 - \left(\frac{1}{3}\right)^n \right]$$

ΣΥΝΔΥΑΖΟΝΤΑΣ ΤΑ :

και λαμβάνοντας υπόψη

$$\text{ότι } 1 - \left(\frac{1}{3}\right)^0 = 0$$

$$y[n] = \frac{1}{2} \left[1 - \left(\frac{1}{3}\right)^n \right] u[n]$$

$$= \frac{1}{2} \left[1 - \left(\frac{1}{3}\right)^n \right] u[n-1]$$

Γ.4

$$\frac{d^2 y(t)}{dt^2} + 3 \frac{dy(t)}{dt} + 2y(t) = 3 \frac{dx(t)}{dt} + 5x(t)$$

$$s = j\Omega \Rightarrow H(s) = \frac{3s+5}{s^2+3s+2} = \frac{3s+5}{(s+1)(s+2)} = \frac{2}{s+1} + \frac{1}{s+2}$$

$$\Rightarrow h(t) = [2e^{-t} + e^{-2t}] u(t)$$

$$\frac{3s+5}{s+2} \Big|_{s=-2} = \frac{+2}{+1}$$

$$\frac{3s+5}{s+1} \Big|_{s=-1} = -1$$