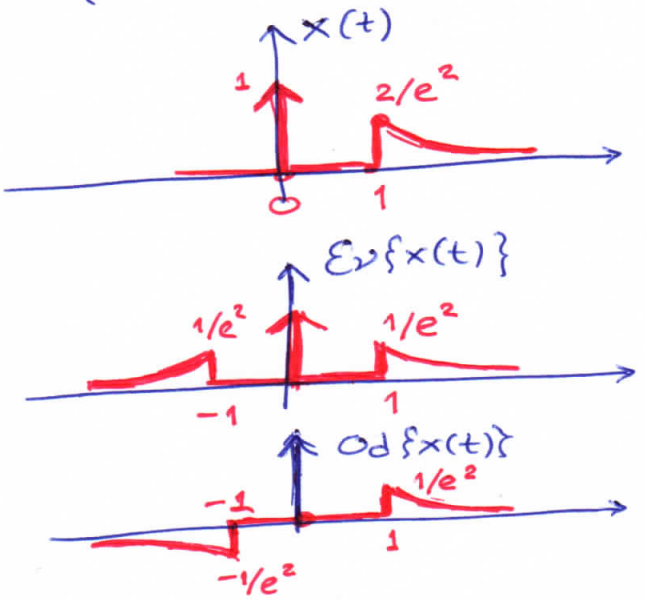
ΗΥ241 — 13/14 — ΠΡΟΟΔΟΣ — Α

Α1α

$$x(t) = \delta(t) + 2e^{-2t}u(t-1)$$

$$\Rightarrow \begin{cases} Ev\{x(t)\} = \dfrac{x(t)+x(-t)}{2} = e^{-2t}u(t-1) + \delta(t) + e^{2t}u(-t-1) \\ Od\{x(t)\} = \dfrac{x(t)-x(-t)}{2} = e^{-2t}u(t-1) - e^{2t}u(-t-1) \end{cases}$$



Α1b

$$x(t) - \delta(t) = \underbrace{2e^{-2t}u(t-1)}_{y(t)}$$

$$\text{Energy} = \int_{-\infty}^{+\infty} |y(t)|^2 dt = \int_{1}^{+\infty} 4e^{-4t} dt = e^{-4t}\Big|_{+\infty}^{1} = e^{-4}$$

$$\text{Power} = 0$$

Α1c

$$x[n] = \left[\cos\left[3n - \frac{\pi}{3}\right]\right]^2$$

$$\cos^2\theta = \frac{1+\cos(2\theta)}{2}$$

$$\Rightarrow x[n] = \frac{1}{2} + \frac{\cos(6n - 2\pi/3)}{2}$$

ok ↵

↳ ΜΗ ΠΕΡΙΟΔΙΚΟ: $\frac{2\pi}{6}$ ΑΡΡΗΤΟΣ

Α2α

$$y(t) = x(\sin(t))$$ αιτιατό ?

Για $t = -2\pi$: $y(-2\pi) = x(0)$ $\Rightarrow$ ΜΗ ΑΙΤΙΑΤΟ

↳ $\sin(t) = 0$

Α2β

$$y[n] = 2\sum_{k=-\infty}^{n} x[k]$$ ΑΝΤΙΣΤΡΕΨΙΜΟ ?

↳ Πρόκειται για αθροισή ...., συνεπώς:

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

$$= \frac{2}{2}\left(\sum_{k=-\infty}^{n} x[k] - \sum_{k=-\infty}^{n-1} x[k]\right) = x[n]$$

Α4

$$\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = \frac{3dx(t)}{dt} + 4x(t)$$

$s = j\Omega \Rightarrow$ $H(s) = \dfrac{3s+4}{s^2+3s+2} = \dfrac{3s+4}{(s+1)(s+2)} = \dfrac{1}{s+1} + \dfrac{2}{s+2}$

$= \left.\dfrac{3s+4}{s+2}\right|_{s=-1} = \dfrac{-3+4}{-1+2}$

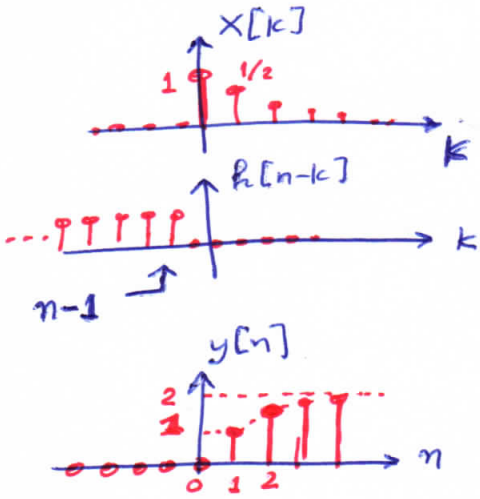
$\left.\dfrac{3s+4}{s+1}\right|_{s=-2} = \dfrac{-6+4}{-2+1}$

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

A 3

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

$$h[n] = u[n-1]$$



$n-1 < 0 \Leftrightarrow n < 1$: $y[n] = 0$

$n \geq 1$:

$$y[n] = \sum_{k=0}^{n-1} \left(\frac{1}{2}\right)^k = \frac{1 - \left(\frac{1}{2}\right)^n}{1 - \frac{1}{2}} =$$

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

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

για $n = 0$: $2[1-1] = 0$

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