Homework 2
Deadline:
1401/1/15
23:59

signal and systems

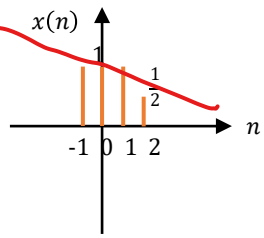
1- if $x(t) = \sum_{k=-\infty}^{\infty} \beta_k \psi_k$ and $y(t) = \sum_{k=-\infty}^{\infty} \alpha_k \psi_k$ and ψ_k is from orthogonal set, solve the following statement in terms of α_k and β_k.
note: the notation for the complex conjugate of z is z^*

$$\int x(t).y(t)^*$$

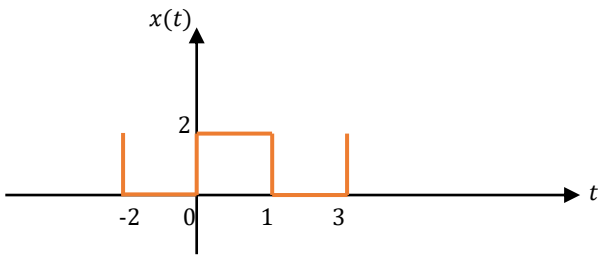
2- suppose the delta function is defined as follows.

$$\delta(n) = \begin{cases} 1 & if\ n = 0 \\ 0 & if\ n \neq 0 \end{cases}$$

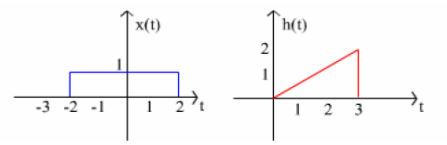
decompose the following signal using the delta function.



3- if $\Psi = \{\exp(jkw_0 t), k \in Z\}$ and $x(t)$ is given to you as follows.
prove Ψ is an an orthogonal set and decompose $x(t)$ using Ψ.



4- convolve x and h
calculate the resulting function and sketch that.



convolution formula:

$$x(t) * h(t) = \int_{-\infty}^{\infty} x(\tau)h(t-\tau)d\tau$$

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5- find the impulse response the system described by $y(t)' + 2y(t) = x(t)$

6- find the impulse response the system described by $y[n] - \frac{1}{2}y[n-1] = x[n]$

7- find the impulse response the system described by $y[n] - \frac{1}{6}y[n-1] - \frac{1}{6}y[n-2] = x[n]$

8- check causality and stability the system described by $y[n] = x[n] + \frac{1}{2}(x[n-1] + x[n+1])$

9- find the impulse response the system described by $y(t)'' + 2y(t)' = x(t)' + 2x(t)$
check causality, stability and memory less factors.