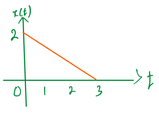
HW1

Tuesday, 11 March 2025 11:17 AM

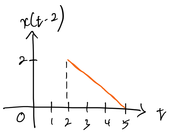
1.24)



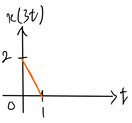
HW1 林聖誠 E24105038 資訊114

(a) $x(t-2)$ (b) $x(3t)$ (c) $y(t) = 1 + 2x(t)$

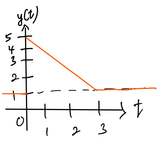
(a)



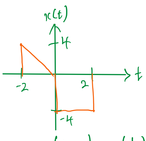
(b)



(c)

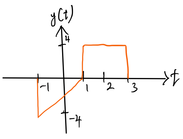


1.29)

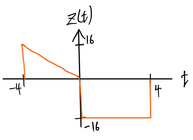


(a) $y(t) = -x(t-1)$ (b) $z(t) = 4x(\frac{t}{2})$ (c) $h(t) = x(2-t)$

(a)

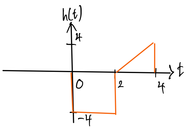


(b)

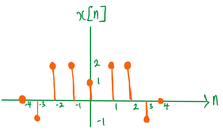


(c) $h(t) = x(2-t)$

$= x(-(t-2))$



1.32)

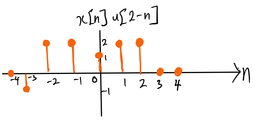


(a) $x[n]u[2-n]$ (b) $x[n][u[n+1]-u[n]]$ (c) $x[n]\delta[n-2]$

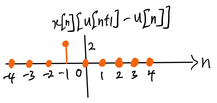
(a) $x[n]u[2-n] = x[n]\,u[-(n-2)]$

$\Rightarrow -(n-2) \geq 0$

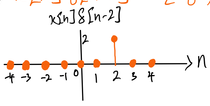
$n \leq 2$



(b) $x[n][u[n+1]-u[n]] = \begin{cases} x[n], & n=-1 \\ 0, & n \neq -1 \end{cases}$



(c) $x[n]\delta[n-2] = \begin{cases} x[n], & n=2 \\ 0, & n \neq 2 \end{cases}$



1.36) Determine which of the systems is linear

(a) $y(t) = \exp[x(t)]$ (b) $y(t) = \cos x(t)$ (c) $y(t) = t^2 x(t)$

(a) $y(t) = \exp[x(t)]$

$\Rightarrow \because \exp[k \cdot x(t)] \neq k \cdot y(t)$

$\therefore$ The system is nonlinear. #

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

$\Rightarrow \because \cos[k \cdot x(t)] \neq k \cdot y(t)$

$\therefore$ The system is nonlinear #

(c) $y(t) = t^2 x(t)$

① $\because t^2 \cdot k\,x(t) = k \cdot y(t)$

② $\because t^2 x_1(t) + t^2 x_2(t) = y_1(t) + y_2(t)$

$\therefore$ It satisfies homogeneity and additivity properties

$\therefore$ The system is linear #

Ans: System (c) is linear. #

1.39) Determine whether the systems are causal or noncausal, memoryless or with memory.

(a) $y(t) = e^{x(t)} \sin t$ (b) $y(t) = \int_0^{t} x(\tau)\,\tau\,d\tau$

(a) $\Rightarrow y(t)$ depends only on the present values of input $x(t)$

$\therefore$ memoryless

$\Rightarrow y(t)$ does not depend on the future values of input $x(t)$

$\therefore$ Causal

$\therefore$ The system is causal and memoryless. #

(b) $\Rightarrow y(t)$ does not depend on the future values of input $x(\tau)$

$\therefore$ Causal

$\Rightarrow y(t)$ depends on the values of $x(\tau)$ for $0 < \tau < t$

$\therefore$ With memory

$\therefore$ The system is causal and with memory. #