- LTIC systems - Example # 5-cont
  - For each of the following systems, determine if they are linear, time-invariant, BIBO stable and/or causal:

3. $y(t) = f^2(t)$

ZS linear: ↑ as a function of f, this is not a line ⇒ X

T.I.: $y(t) = f^2(t)$ — same time ⇒ T.I. V

BIBO stable: $y(t) = f^2(t)$

$|f(t)| \le C \Rightarrow |f^2(t)| \le C^2 \Rightarrow$ V

Causal: $y(t) = f^2(t)$ — same t, present ⇒ causal V

- LTIC systems - Example # 5-cont

  - For each of the following systems, determine if they are linear, time-invariant, BIBO stable and/or causal:

4. $y(t) = f(t) * u(t-1)$, with $u(t-1)$ underbraced as $h(t)$

$f(t) \rightarrow \boxed{\underset{h(t)}{LTI}} \rightarrow y(t) = f(t) * h(t)$

$\Rightarrow$ Linear + T.I. ✓

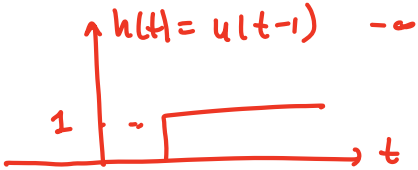
$f^2(t)$ ↖ it breaks linearity

$f(t^2)$ ↖ it breaks T.I.

BIBO stable: if LTI

BIBO $\Leftrightarrow \int_{-\infty}^{\infty} |h(t)|\,dt < \infty$

$h(t) = u(t-1)$ — not A.I. $\Rightarrow$ not A.I. $\Rightarrow$ X



causal: if LTI:

causal $\Leftrightarrow h(t) = 0 \quad t < 0$ ✓

Chapter objectives

- Understand the meaning of an LTI system's impulse response and its relation to the frequency response
- Understand and test for BIBO stability
- Understand and test for causality of systems and signals