Einheit 17

Mittwoch, 5. November 2025 19:52

LTI-Systeme

$$u(t) \longrightarrow \boxed{f(u)} \longrightarrow y(t)$$

Linear - Zeitinvariant

$$\begin{matrix} u \to y \\ v \to z \end{matrix} \Rightarrow u + v \to y + z$$

$$f(u) + f(v) = f(u+v)$$

$$f(x) = 15x \quad \text{lin.}$$

$$f(x) = x + 1$$

$$u + 1 + v + 1 \neq u + v + 1 \Rightarrow \text{N. linear}$$

$$f(x) = x^2$$

$$u^2 + v^2 \neq (u+v)^2$$

$$f(x) = \frac{d}{dt} x$$

$$u' + v' = (u+v)' \Rightarrow \text{linear!}$$

$$f(u(t)) \mathrel{\hat{=}} f(u(t - t_0))$$

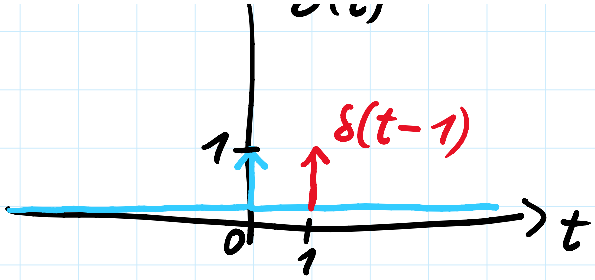
$$t + 1 \mathrel{\hat{=}} t - t_0 + 1$$

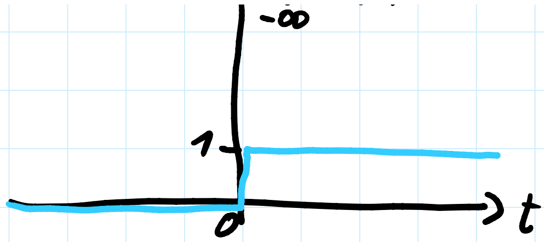
$$f(x) = x \cdot t \qquad \text{N. Zeitinvariant}$$

$$t \cdot t \mathrel{\hat{=}} (t - t_0) \cdot t = t^2 - t_0^2$$

$\delta(t)$

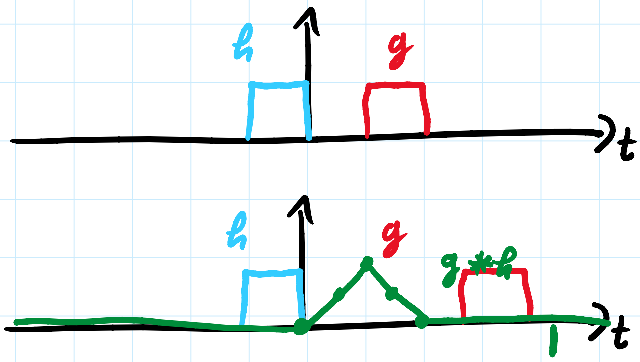
$$\int_{-\infty}^{t} \delta(t)\, dt$$

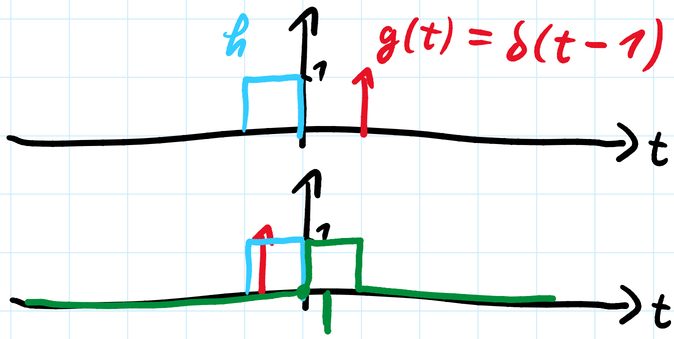




$$g(t) * h(t) = \int_{-\infty}^{\infty} \underset{h}{g(\tau)} \cdot \underset{g}{h(t-\tau)}\, d\tau = f(t)$$

$$= h(t) * g(t)$$





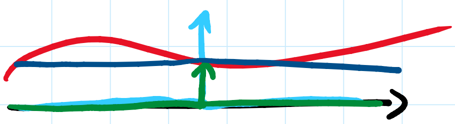
$h(t) * \delta(t) = h(t)$

$h(t) * \delta(t-t_0) = h(t-t_0)$

$(K\cdot h) * g = K\cdot(h * g)$

$h * g + i * g = (h+i) * g$

$$h(t)\cdot\delta(t-t_0) \equiv \overbrace{h(t_0)}^{\text{Konst.!}}\cdot\delta(t-t_0)$$ Ausblend-Eigenschaft.



Ü 10.2.

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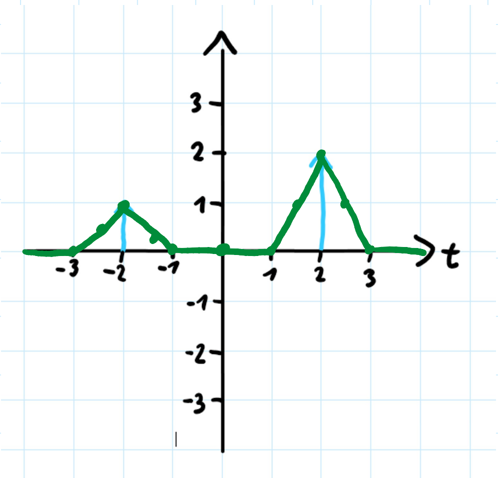

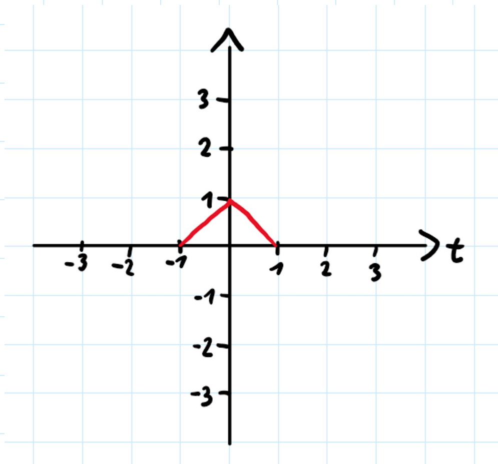

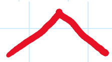

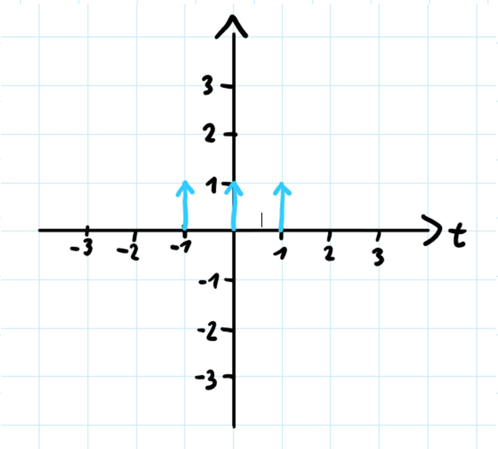

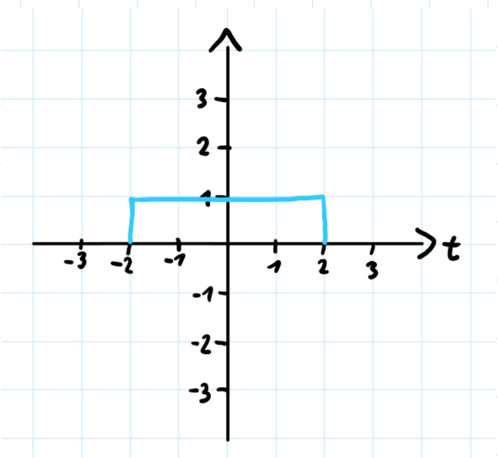

$$u \longrightarrow \boxed{h(t)} \longrightarrow y$$

$$\boxed{y = u * h}$$

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$$Y = U \cdot H$$

$y(t)$