

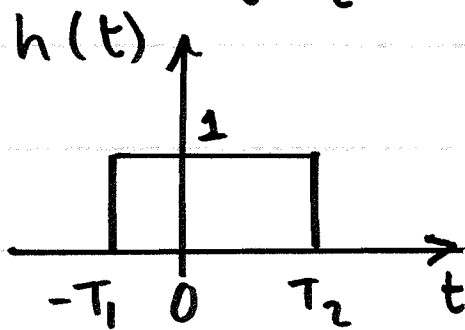
• Common Examples:

• Integrator:

$$y(t) = \int_{t-T_2}^{t+T_1} x(\tau) d\tau \quad \begin{matrix} T_1 \geq 0 \\ T_2 \geq 0 \end{matrix}$$

Impulse response?  $h(t) = ?$  let  $x(t) = \delta(t)$

$$h(t) = \int_{t-T_2}^{t+T_1} \delta(\tau) d\tau = 1 \quad \text{if} \quad \begin{cases} t+T_1 > 0 \Rightarrow t > -T_1 \\ t-T_2 < 0 \Rightarrow t < T_2 \end{cases}$$



causal? No, unless  $T_1 = 0$

stable? Yes  $\int_{-\infty}^{\infty} |h(t)| dt < \infty$

as long as  $T_2 < \infty$

• Special case:  $T_1 = 0$  and  $T_2 = \infty$

$$y(t) = \int_{-\infty}^t x(\tau) d\tau \quad \Rightarrow \quad h(t) = u(t) \quad \Rightarrow \quad \begin{matrix} \text{causal, but} \\ \text{not stable} \end{matrix}$$