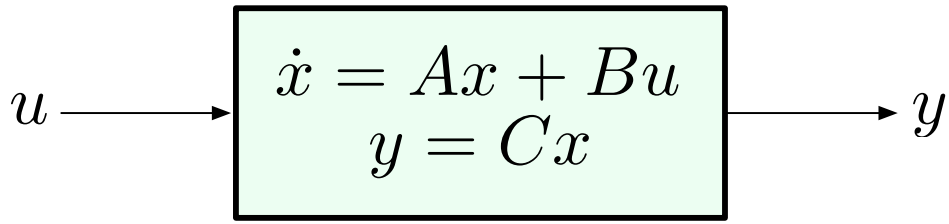
Impulse Response



zero initial condition: $x(0) = 0$

The *superposition principle:* the response of a linear system to a sum (or integral) of inputs is the sum (or integral) of the individual responses to these inputs.

$$u(t) = \int_{-\infty}^{\infty} u(\tau)\delta(t-\tau)\mathrm{d}\tau \quad \longrightarrow \quad y(t) = \int_{-\infty}^{\infty} u(\tau)\underbrace{h(t-\tau)}_{\substack{\text{response to} \\ \delta(t-\tau)}}\mathrm{d}\tau$$

— the integral that defines $y(t)$ is a convolution of u and h.