

Linear-Time Invariant Systems!



$$y[n] = \sum_{k=-\infty}^{\infty} h[k] x[n-k]$$

$$y[n] = \sum_k x[k] h[n-k]$$

↑
convolution sum!

Ex1 $h[n] = \{ \underset{\substack{\uparrow \\ n=0}}{1}, 2 \} \leftarrow \text{FIR}$

Find the I/O relation for $h[n]$.

FIR: Finite-extent impulse resp.

$$y[n] = h[0]x[n] + h[1]x[n-1]$$

$$y[n] = 1x[n] + 2x[n-1]$$

In general

$$h[n] = \{a_{-M}, a_{-M+1}, \dots, \underset{\substack{\uparrow \\ n=0}}{a_0}, a_1, \dots, a_L\}$$

I/O relation:

$$y[n] = \sum_{k=-M}^L a_k x[n-k]$$

where $h[k] = a_k$, for $k = -M, \dots, L$