

Let the output of a DT system $y[n]$ be related to its input $x[n]$ according to

$$y[n] - 0.5y[n-1] = 2x[n]$$

with initial conditions $y[-1] = 0$ ✓

Compute the impulse response of the system $h[n]$

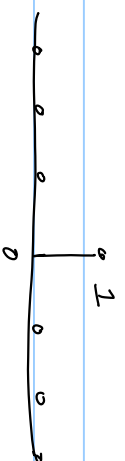
$x[n]$ is the impulse function

$$x[n] = \delta[n]$$

$$y[0] = 2 \iff y[0] - \frac{1}{2}y[-1] = 2 \cdot 1$$

$$y[1] = 1 \quad y[1] - \frac{1}{2}y[0] = 2x[1]$$

$$y[2] = \frac{1}{2} \quad y[2] - \frac{1}{2}y[1] = 2x[2] = 0$$



$$x[0] = 1 \quad x[n] = 0 \text{ for } n \neq 0$$

$$\vdots$$

$$y[n] - \frac{1}{2} y[n-1] = 2x[n] = 0$$

$$y[n] = \frac{1}{2} y[n-1]$$

$$y[n] = 2 \cdot \left(\frac{1}{2}\right)^n \quad n \geq 0$$


$$h[n] = 2 \cdot \left(\frac{1}{2}\right)^n \quad n \geq 0$$

$$= 0 \quad n < 0$$

$$h[n] = 2 \left(\frac{1}{2}\right)^n u[n]$$

Recap

- * Impulse response is a signal
- * It is the response of the system to an input which is the impulse signal
- * Find $y[n]$ when $x[n] = \delta[n]$