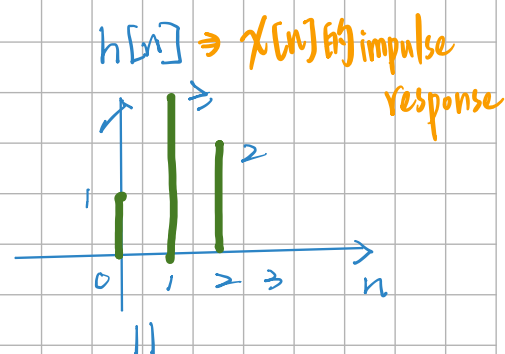
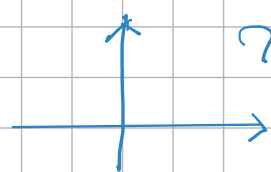
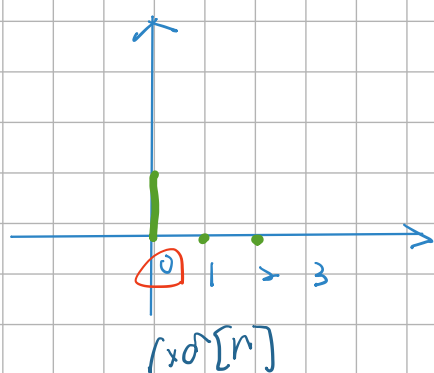


Impulse Response

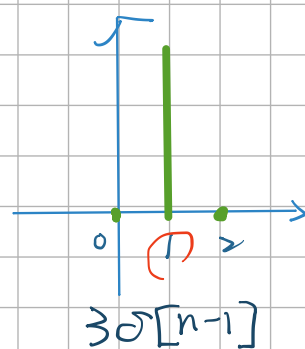
↪ 輸入 $\delta[n]$ 系統的輸出 $\Rightarrow h[n]$



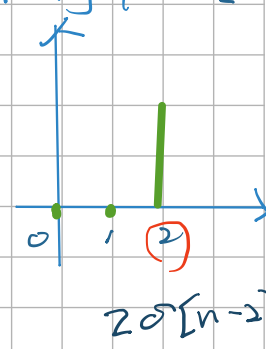
$$= 1 \times \delta[n] + 3\delta[n-1] + 2\delta[n-2]$$



輸入當下 的輸出

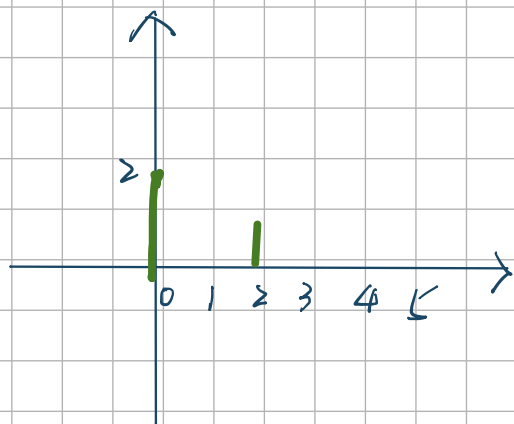


輸入延遲
1個 sample
的輸出

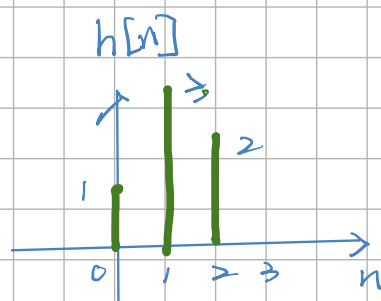


輸入延遲
2個 sample
的輸出

假設 $x[n]$ 如下圖



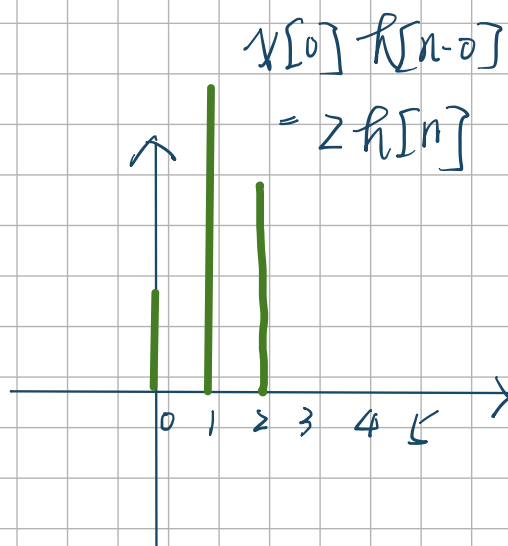
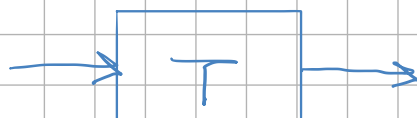
Conv



$$x[n] = \underbrace{2 \delta[n]}_{\textcircled{1}} + \underbrace{1 \delta[n-2]}_{\textcircled{2}}$$

①

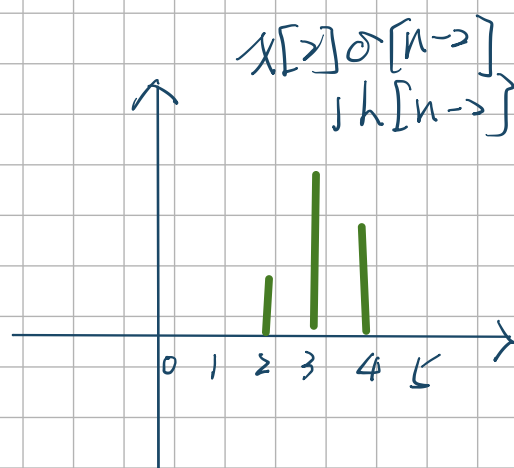
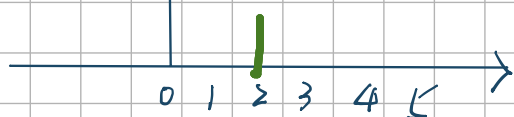
$$x[0] \delta[n-0] = 2 \delta[n]$$



$$x[1] \delta[n-1] = 0$$

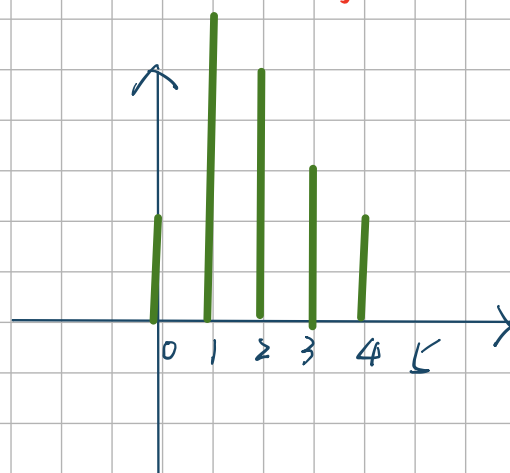
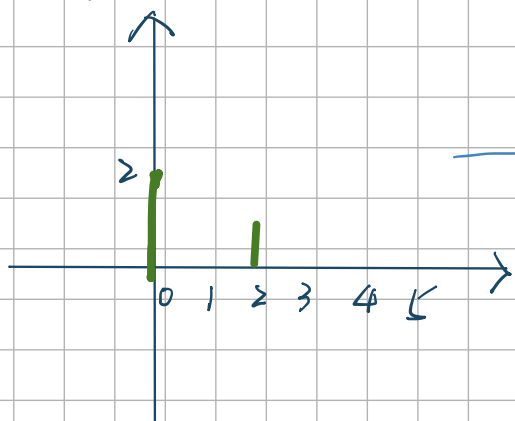
②

$$x[2] \delta[n-2] = 1 \delta[n-2]$$

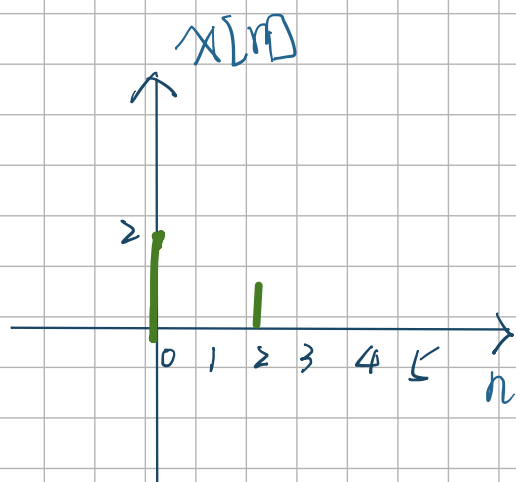


$$y[n] = x[n] * h[n] = x[0]h[n-0] + x[1]h[n-1] + x[2]h[n-2] = \sum x[k]h[n-k]$$

↪ 打開後算完再相加



Graphical Discrete-time Convolution



進入系統順序

$\dots x[3] \ x[2] \ x[1] \ x[0]$



$$x[n] = 2\delta[n] + 1\delta[n-2]$$

$n=0$ 只有 $x[0]$ 進入系統產生 $x[0] \cdot h[0]$ 輸出

$$y[0] = x[0] \cdot h[0]$$

$n=1$ $x[1]$ 進入系統產生 $h[0]x[1]$

$x[0]$ 進入系統一個時間 delay 產生 $h[1]x[0]$

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

$$n=2$$

$$y[2] = h[0]x[2] + h[1]x[1] + h[2]x[0]$$

$$\underline{y[n] = \sum_{k=0}^n h[k] \cdot x[n-k]}$$

$$y[n] = \sum_{k=0}^n h[k] x[n-k]$$

