

Q48

Note Title

2/17/2014

Given

Q: $y[n] = x[n] - 0.5y[n-1]$, find $h[n]$.

Ans: $h[n] = \delta[n] - 0.5h[n-1]$.

$$h[-2] = 0$$

$$h[-1] = 0 - 0 = 0.$$

$$h[0] = 1 - 0.5 \cdot 0 = 1$$

$$h[1] = 0 - 0.5 \cdot 1 = -0.5$$

$$h[2] = 0 - 0.5(-0.5) = 0.25$$

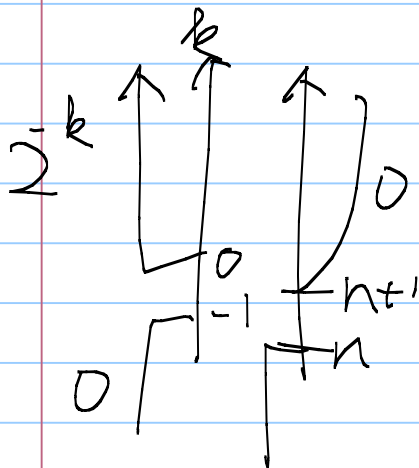
$$h[n] = (-0.5)^n u[n]$$

Q: $y[5] = ?$ $x[n] = 2^{-n} u[n]$

Ans: $y[5] = \sum_{k=-\infty}^{\infty} x[k] h[5-k]$

Q: $y[n] = ?$

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



$$h[n-k] = \begin{cases} (-0.5)^{n-k} & \text{if } n-k \geq 0 \\ 0 & \text{if } k > n \end{cases}$$

Case 1: $n \leq -1$

$$y[n] = 0.$$

Case 2: $n \geq 0$

$$y[n] = \sum_{k=0}^n 2^{-k} \cdot (-0.5)^{n-k}$$

$$= (-0.5)^n \cdot \sum_{k=0}^n \left(2^{-1} \cdot (-0.5)^{-1} \right)^k$$

$$= (-0.5)^n \cdot \sum_{k=0}^n (-1)^k$$

$$= (-0.5)^n \cdot \frac{1 - (-1)^{n+1}}{1 - (-1)}$$

$$y[5] = 0 \times$$