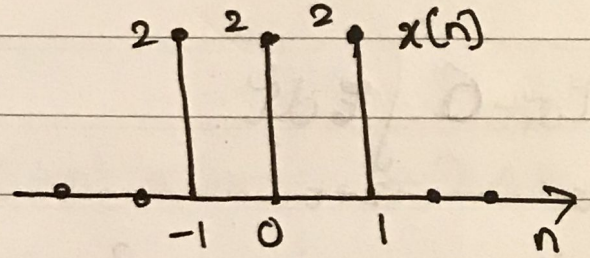
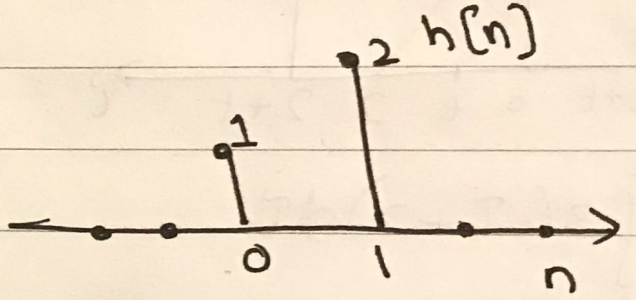
PROBLEM #13:

Convolve the following two functions:

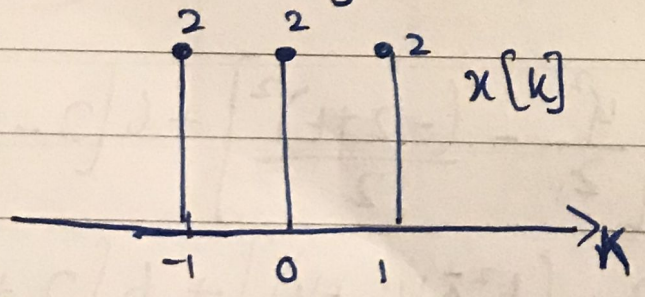


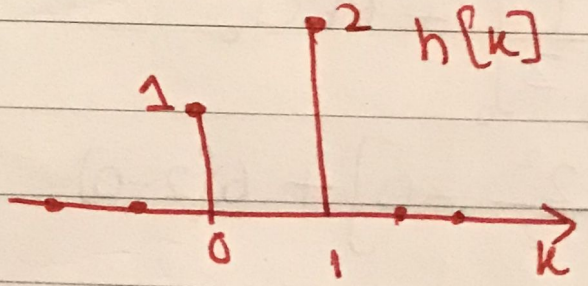
$*$



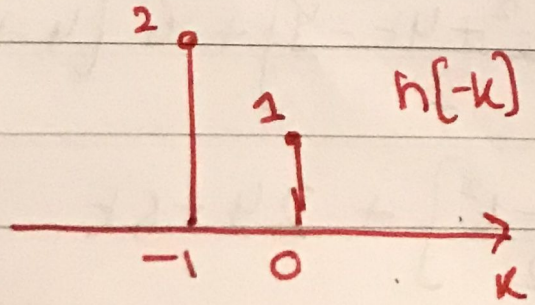
SOL:

Step 1: Change $n \to k$

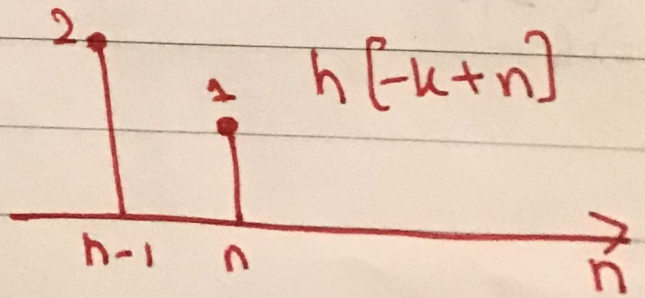




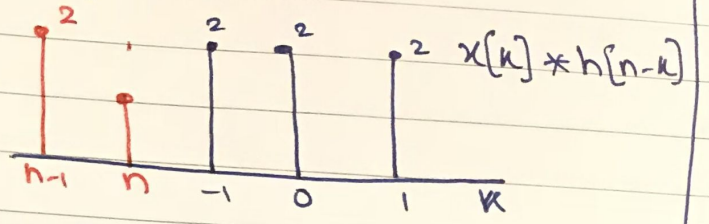
Step 2: flip h(k) and ~~or~~ shift



$\Rightarrow$

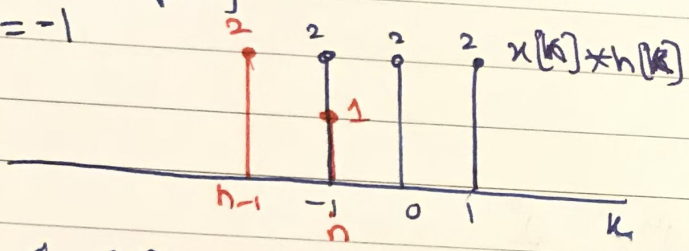


Step #3: Now ~~overlap~~ convolve the two signals.



$y[n] = 0$ as there is no overlapping.

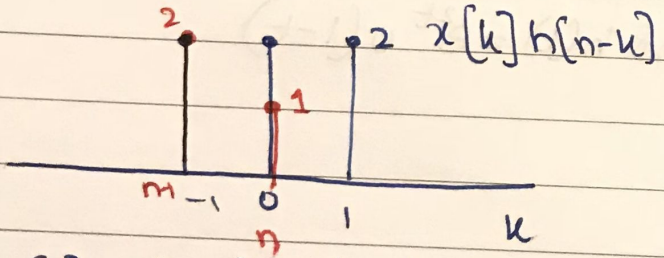
∴ n = -1



$y[-1] = \sum x[k]h[n-k]$

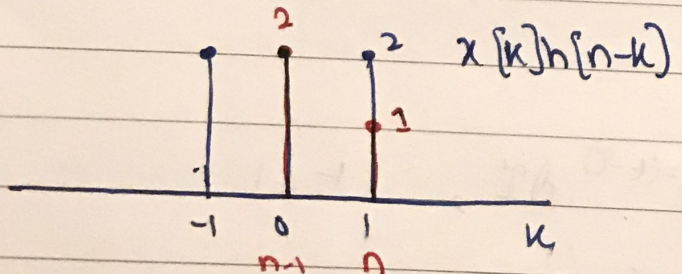
$= (2\times0) + (1\times2) \Rightarrow 2$

∴ n = 0



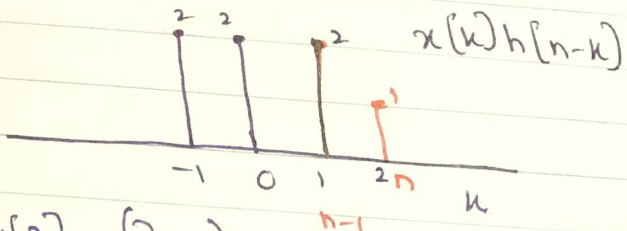
$y[0] = (2\times2) + (1\times2) = 4+2 \Rightarrow 6$

∴ n = 1



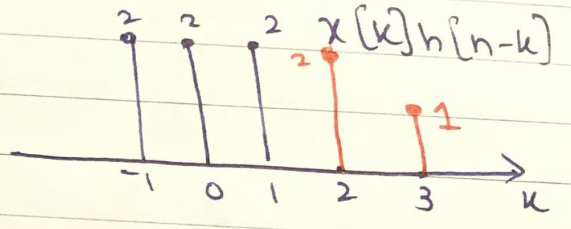
$y[1] = (2\times2) + (1\times2) \Rightarrow 6$

∴ n = 2



$y[2] = (2\times2) + (1\times0) \Rightarrow 4$

∴ n = 3



$y[3] = 0$ as there is no overlapping

$$y[n] = \begin{cases} 0 & n < -1 \\ 2 & n = -1 \\ 6 & n = 0 \\ 6 & n = 1 \\ 4 & n = 2 \\ 0 & n = 3 \end{cases}$$