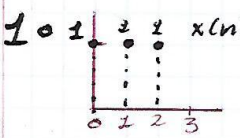
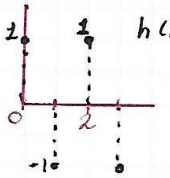
A23
Ejercicios de convolución

Coronado Saucedo Fabricio
18310065
13 de abril

• Encontrar la convolución "$y(n) = x(n) * h(n)$" o "$y(n) = x_1(n) * x_2(n)$" de las siguientes señales





$x(n) = [\underline{1}, 1, 1]$
$h(n) = [\underline{1}, -1, 1, -1]$

- tomamos una de las dos señales y la reflejamos

$x(n) = [\underline{1}, 1, 1]$ $\quad$ $h(n) = [\underline{1}, -1, 1, -1]$

$x(n)' = [1, 1, \underline{1}]$ $\quad$ $h(n)' = [-1, 1, -1, \underline{1}]$

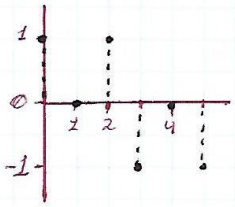
- hacemos la siguiente tabla, moviendo ~~la~~ nuestra grafica reflejada

la posición inicial se obtiene sumando las posiciones iniciales de las graficas en la tabla

$y(0) = 1$
$y(1) = 1 - 1 = 0$
$y(2) = 1 - 1 + 1 = 1$
$y(3) = -1 + 1 - 1 = -1$
$y(4) = 1 - 1 = 0$
$y(5) = -1$

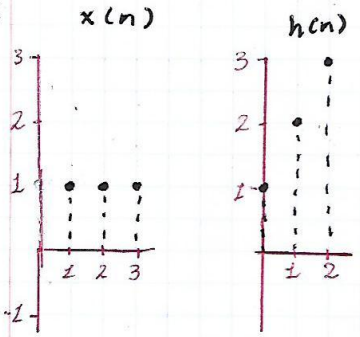
$y(n) = [\underline{1}, 0, 1, -1, 0, -1]$ ⟵ 6 valores

Las cantidad de valores finales es igual al total de ambas graficas iniciales − 1



Coronado Solcedo Fabricio
1831006S
13 de abril

2



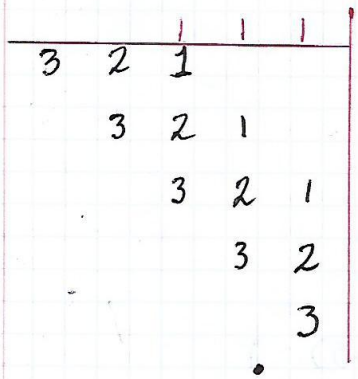
posición 1

$x(n) = [\odot, 1, 1, 1]$

$h(n) = [\textcircled{1}, 2, 3]$

$h(n)' = [3, 2, \textcircled{1}]$

posición = 2



$y(-1) = 1$

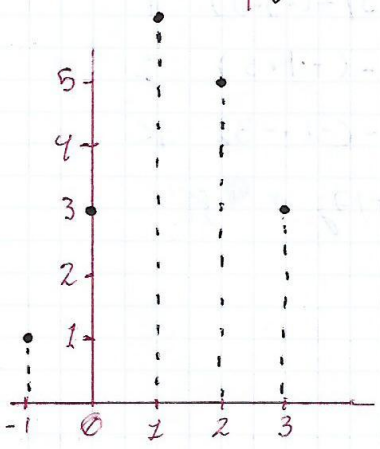
$y(0) = 3$

$y(1) = 6$

$y(2) = 5$

$y(3) = 3$

$y(n) = [1, \underset{\downarrow}{3}, 6, 5, 3]$



Coronado Salcedo Fabricio
1831006
13 abril

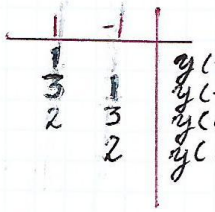
3.

$$x(n)\begin{cases} 1, & n=0 \\ -1, & n=1 \\ 0, & \text{otherwise} \end{cases} \qquad h(n)\begin{cases} 1, & n=0 \\ 3, & n=1 \\ 2, & n=2 \\ 0, & \text{otherwise} \end{cases}$$

$x(n) = [1^{\circ}, -1]$

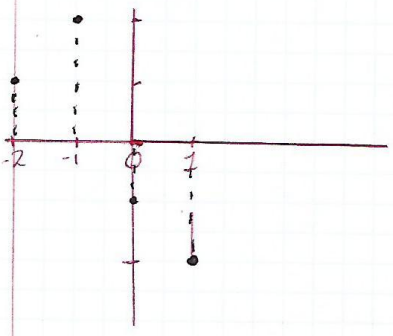
$h(n) = [1^{\circ}, 3, 2]$

$h(n)^{*} = [2, 3, 1^{\circ}]$



$y(-2) = 1$
$y(-1) = 2$
$y(0) = -1$
$y(1) = -2$

$y(n) = [1, 2, -1, -2]$



4. a

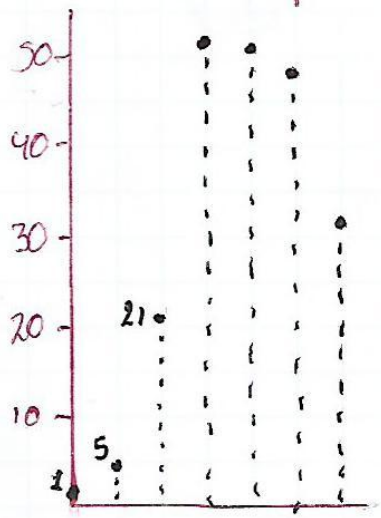
$x[n] = u[n] = [1, 1, 1, 1]$

$h[n] = 4^n u[n] = [1, 4, 16, 32]$

$h[n]' = [32, 16, 4, 1]$

1	1	1	1
1			
4	1		
16	4	1	
32	16	4	1
	32	16	4
		32	16
			32

$y(0) = 1$
$y(1) = 5$
$y(2) = 21$
$y(3) = 53$
$y(4) = 52$
$y(5) = 48$
$y(6) = 32$

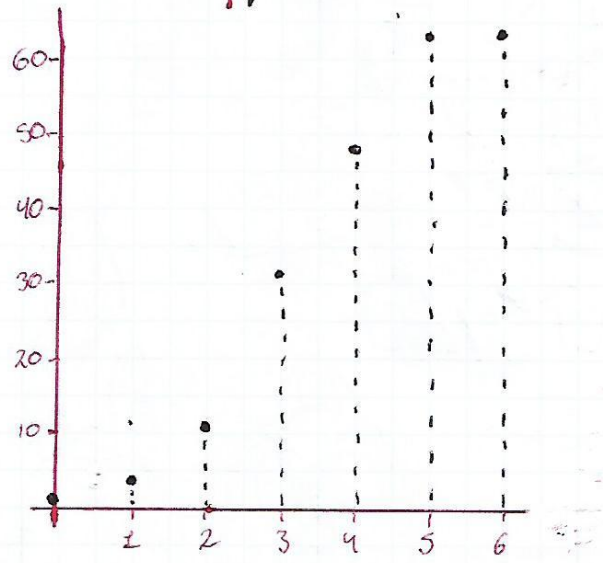


4.b

$x[n] = h[n] = 2^n u[n] = [1, 2, 4, 8]$

$h[n]` = [8, 4, 2, 1]$

1	2	4	8	
1				$y(0) = 1$
2	1			$y(1) = 4$
4	2	1		$y(2) = 12$
8	4	2	1	$y(3) = 32$
	8	4	2	$y(4) = 48$
		8	4	$y(5) = 64$
			8	$y(6) = 64$



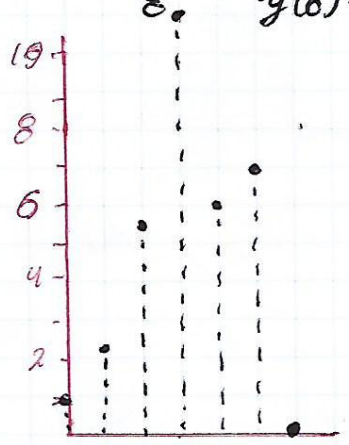
18310065

4. c $x[n] = (0.3)^n u[n] = [1, .3, .9, .027]$

$h[n] = 2^n u[n] = [1, 2, 4, 8]$

$h[n]' = [8, 4, 2, 1]$

1	.3	.9	.027	
1				$y(0) = 1$
2	1			$y(1) = 2.3$
4	2	1		$y(2) = 5.5$
8	4	2	1	$y(3) = 11.27$
	8	4	2	$y(4) = 6.05$
		8	4	$y(5) = 2.3$
			8	$y(6) = .216$



5. $x(n) = 2(3)^n u(n) = [2, 6, 18, 54]$

$h(n)\ 3(2)^n u(n) = [3, 6, 12, 24]$

$h(n)' = [54, 18, 6, 2]$

3	6	12	24
2			
6	2		
18	6	2	
54	18	6	2
	54	18	6
		54	18
			54

$y(0) = 6$

$y(1) = 30$

$y(2) = 114$

$y(3) = 390$

$y(4) = 684$

$y(5) = 1080$

$y(6) = 1296$