

Tutorial 2

Q2

$$\begin{array}{ccccccccc} n & -2 & -1 & 0 & 1 & 2 & 3 \\ a(n) & 1 & 2 & -1 & 4 & 3 & 5 \end{array}$$

$$\begin{array}{cccccc} n & 2 & 3 & 4 & 5 & 6 \\ h(n) & 1 & -1 & 2 & -2 & 3 \end{array}$$

$$\begin{aligned} y(n) &= \sum_{k=-\infty}^{\infty} a(n-k)h(k) = \sum_{k=-\infty}^{\infty} a(k)h(n-k) \end{aligned}$$

Now for $n \leq -1$, $y(n) = 0$

eg $h(n-k) =$

$$\begin{array}{ccccccccc} & 3 & & -2 & & 2 & & -1 & & 1 \\ & | & & | & & | & & | & & | \\ n-6 & & n-5 & & n-4 & & n-3 & & n-2 \end{array}$$

for $n=0$

$$y(0) = a(-2)h(+2) = 1$$

$$y(1) = a(-1)h(2) + a(-2)h(3) = 1$$

$$\begin{aligned} y(2) &= a(-2)h(4) + a(-1)h(3) \\ &\quad + a(0)h(2) \\ &= -1 \end{aligned}$$

$$\begin{aligned} y(3) &= a(-2)h(5) \\ &\quad + a(-1)h(4) + a(0)h(3) \\ &\quad + a(1)h(2) \\ &= -2 + 4 + 4 + 1 \\ &= 7 \end{aligned}$$

$$\begin{aligned} y(4) &= a(-2)h(6) + a(-1)h(5) + a(0)h(4) \\ &\quad + a(1)h(3) + a(2)h(2) \\ &= 3 + 3 - 4 - 4 - 2 = -4 \end{aligned}$$

$$\begin{aligned}
 y(5) &= \cancel{12} \\
 &\quad + \alpha(-1)h(6) \\
 &\quad + \alpha(6)h(5) + \alpha(1)h(4) + \alpha(2)h(3) \\
 &\quad + \alpha(3)h(2) \\
 &= 6 + 2 + 8 + (-3) + 5 \\
 &= 18
 \end{aligned}$$

$$\begin{aligned}
 y(6) &= \alpha(0)h(6) + \alpha(1)h(5) \\
 &\quad + \alpha(2)h(4) + \alpha(3)h(3) \\
 &= -3 - 8 + 6 - 5 \\
 &= -10
 \end{aligned}$$

$$\begin{aligned}
 y(7) &= \alpha(1)h(6) + \alpha(2)h(5) + \alpha(3)h(4) \\
 &= 12 + (-6) + 10 \\
 &= 16
 \end{aligned}$$

$$\begin{aligned}
 y(8) &= \alpha(2)h(6) + \alpha(3)h(5) \\
 &= 9 - 10 = -1
 \end{aligned}$$

$$y(9) = \alpha(3)h(6) = 15$$

n	0	1	2	3	4	5	6	7	8	9
Hence $y(n)$	1	1	-1	7	-4	18	-10	16	-1	15

$y(n) = 0$ for all other points