Examples Set 1

Note Title

(1) The sum of the coefficients of an N-point FWMA or MA is 1.0

(2) Compute the unit-pulse response $h[n]$ for $n = 0, 1, 2, 3$ for the following discrete-time system.

$$y[n+2] + a\,y[n+1] = x[n]$$

rearrange the equation

$$y[n+2] = -a\,y[n+1] + x[n]$$

for unit-pulse response, the input $x[n]$ becomes $\delta[n]$ and the output $y[n]$ is denoted by $h[n]$

$$\therefore\ h[n+2] = -a\,h[n+1] + \delta[n]$$

$n = 0 \rightarrow h[2] = -a\,h[1] + \delta[0]$, but $h[1] = -a\,h[0] + \delta[-1]$ & $h[0] = -a\,h[-1] + \delta[-2]$

$\Rightarrow h[0] = 0$ & $h[1] = 0$

$\therefore h[2] = \delta[0] = 1$

$n = 1 \rightarrow h[3] = -a\,h[2] + \delta[1] = -a$

$n = 2 \rightarrow h[4] = -a\,h[3] + \delta[2] = -a(-a) = a^2$

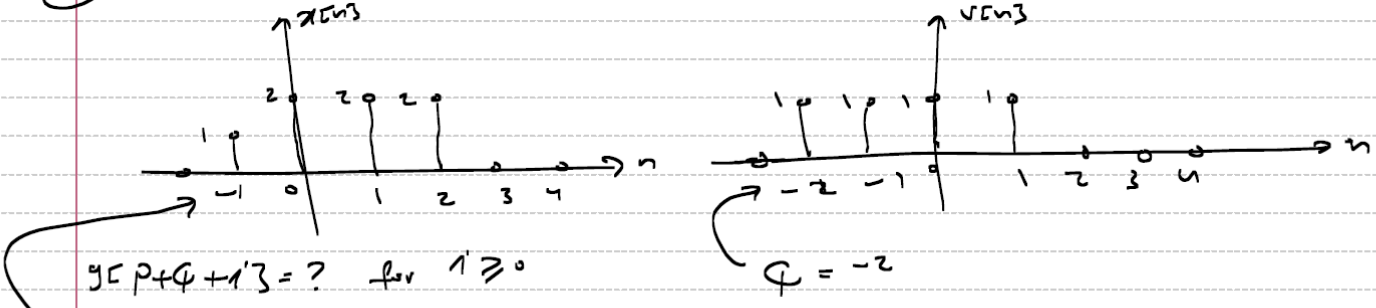
$h = 3 \Rightarrow h[5] = -a\,h[4] + \delta[3] = -a(a^2) = -a^3$

For all values of $n \geq 0$

$h[n] = 0$, $n = 0, 1$

$h[n] = (-a)^n$, $n \geq 2$

(3) Compute the convolution $x[n] * v[n]$ for all n



$y[p+q+1] = ?$ for $1 \geq 0$

$p = -1$

$\therefore\ y[-1-2+1] = ?$ for $1 \geq 0$

$q = -2$

$x[n]$

	1	2	2	2	0
1	1	2	2	2	0
1	1	2	2	2	0
1	1	2	2	2	0
1	1	2	2	2	0
0	0	0	0	0	0

$n'=0$, $n'=1$, $n'=2$, $n'=3$, $n'=4$, $n'=5$, $n'=6$

$\therefore y[-3] = 1$

$y[-2] = 3$

$y[-1] = 5$

$y[0] = 7$

$y[1] = 6$

$y[2] = 4$

$y[3] = 2$