In class exercise:

10/19/2020.

consider $x(n)$, $h(n)$ each $N=3$.

A.) compute their linear convolution.

$x(n) \longleftrightarrow X(k)$

$h(n) \longleftrightarrow H(k)$

$x(n) * h(n) \longleftrightarrow X(k)H(k)$

$y(n) = \sum_{n=-\infty}^{\infty} x(n)h(k-n)$

$= \sum_{n=0}^{K} x(n)h(k-n)$

		$\frac{1}{3}$ $h(0)$	$\frac{1}{3}$ $h(1)$	$\frac{1}{3}$ $h(2)$
1	$x(0)$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$
2	$x(1)$	$\frac{2}{3}$	$\frac{2}{3}$	$\frac{2}{3}$
3	$x(2)$	1	1	1

$\{\frac{1}{3}, 1, 2, 5/3, 1\}$

B.) Now get me N=3 $\circledast$?

$$\begin{array}{c} y(0) \\ y(1) \\ y(2) \end{array} = \begin{bmatrix} h(0) & h(1) & h(2) \\ h(2) & h(0) & h(1) \\ h(1) & h(2) & h(0) \end{bmatrix} \begin{bmatrix} x(0) \\ x(1) \\ x(2) \end{bmatrix} = \Big[$$

c.) now get me N=5 $\circledast$?

$$\begin{array}{c} y(0) \\ y(1) \\ y(2) \\ y(3) \\ y(4) \end{array} = \begin{bmatrix} h(0) & h(1) & h(2) & 0 & 0 \\ 0 & h(0) & h(1) & h(2) & 0 \\ 0 & 0 & h(0) & h(1) & h(2) \\ h(2) & 0 & 0 & h(0) & h(1) \\ h(1) & h(2) & 0 & 0 & h(0) \end{bmatrix} \begin{bmatrix} x(0) \\ x(1) \\ x(2) \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} \\ \\ \\ \\ \\ \end{bmatrix}$$

d.) now get me N=7 $\circledast$?

$$\begin{bmatrix} y(0) \\ \vdots \\ \vdots \\ \vdots \\ \vdots \\ \vdots \\ \vdots \end{bmatrix} = \begin{bmatrix} h(0) & h(1) & h(2) & 0 & 0 & 0 & 0 \\ 0 & h(0) & h(1) & h(2) & 0 & 0 & 0 \\ 0 & 0 & h(0) & h(1) & h(2) & 0 & 0 \\ 0 & 0 & 0 & h(0) & h(1) & h(2) & 0 \\ 0 & 0 & 0 & 0 & h(0) & h(1) & h(2) \\ h(2) & 0 & 0 & 0 & 0 & h(0) & h(1) \\ h(1) & h(2) & 0 & 0 & 0 & 0 & h(0) \end{bmatrix} \begin{bmatrix} x(0) \\ | \\ | \\ | \\ | \\ | \\ x(6) \end{bmatrix}$$

7×7