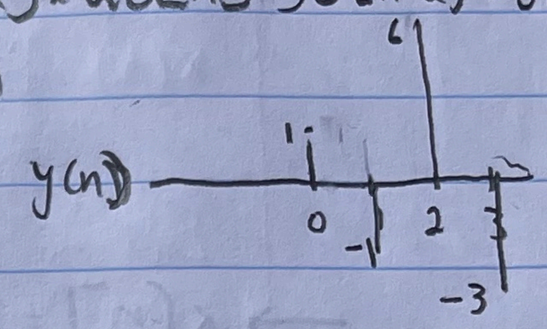
Algebraic Props of Convolution

1. $x[n] * y[n] = y[n] * x[n]$ Commutative
2. $x[n] * (y[n] * z[n]) = (x[n] * y[n]) * z[n]$ Associative
3. $x[n] * (a y[n] + b z[n]) = a x[n] * y[n] + b x[n] * z[n]$ Distributive
4. $x[n] * z[n - n_0] = x[n - n_0]$ Identity

a) $y[n] = (\delta[n] + 3\delta[n-2]) * (2\delta[n] - \delta[n-1])$

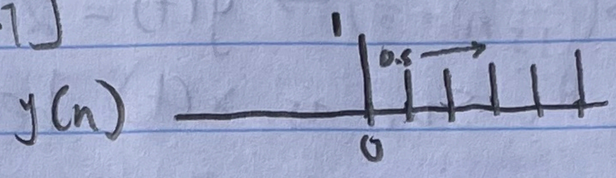
$= \delta[n] * 2\delta[n] - \delta[n] * \delta[n-1] + 3\delta[n-2] * 2\delta[n] \; 3\delta[n-2] * \delta[n-1]$

$= \delta[n] - \delta[n-1] + 6\delta[n-2] - 3\delta[n-3]$

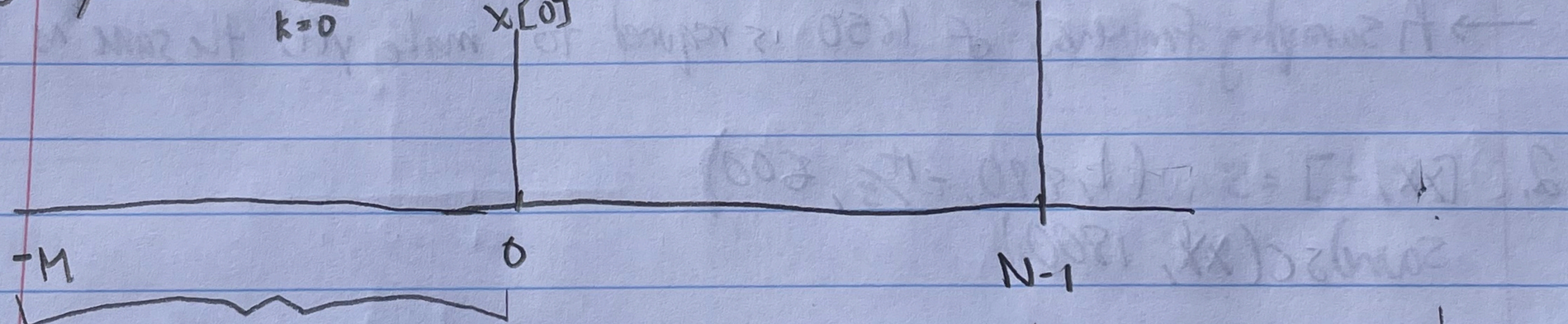


b) $y[n] = v[n] * (\delta[n] - 0.5\delta[n-1])$

$= v[n] - 0.5 v[n-1]$



5.6) $y[n] = \sum_{k=0}^{M} b_k x[n-k]$



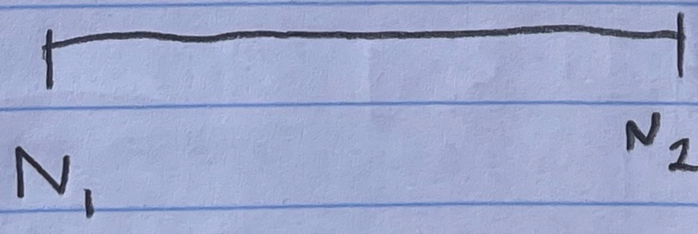
$(P-1) - (N-1) + 1 = M+1$

$N+M = P = N+L-1$

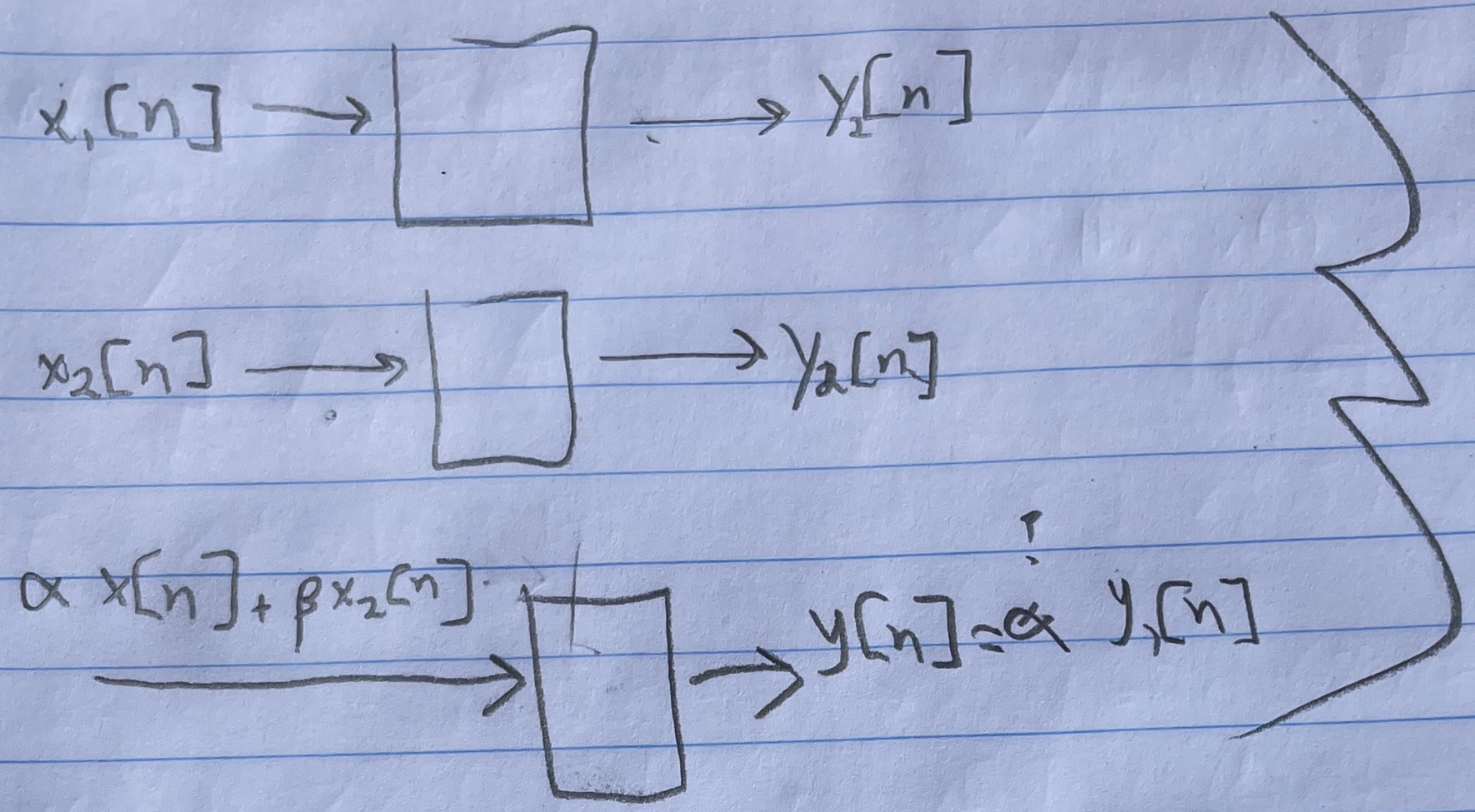
$N_3 = N_1$

$N_4 - N_2 + 1 = M+1 \Rightarrow N_4 = N_2 + M$

b)



Time Invo



$y_1[n] = |x_1[n]|$, $y_2[n] = |x_2[n]|$

$y[n] = |\alpha x_1[n] + \beta x_2[n]| \neq \alpha y_1[n] + \beta y_2[n]$

$y_1[n] = Ax_1[n] + B$ $\quad y_2[n] = Ax_2[n] + B$

$y[n] = A(\alpha x_1[n] + \beta x_2[n]) + B \neq \alpha y[n] + \beta y_2[n]$