Problem 5.3

Given the length-L running sum is defined as :

$$y[n] = \sum_{k=0}^{L-1} x[n-k]$$

The input $x[n]$ is the unit step signal.

(a) Numerical values of $y[n]$ over time interval $-2 \leq n \leq 8$ with $L = 4$:

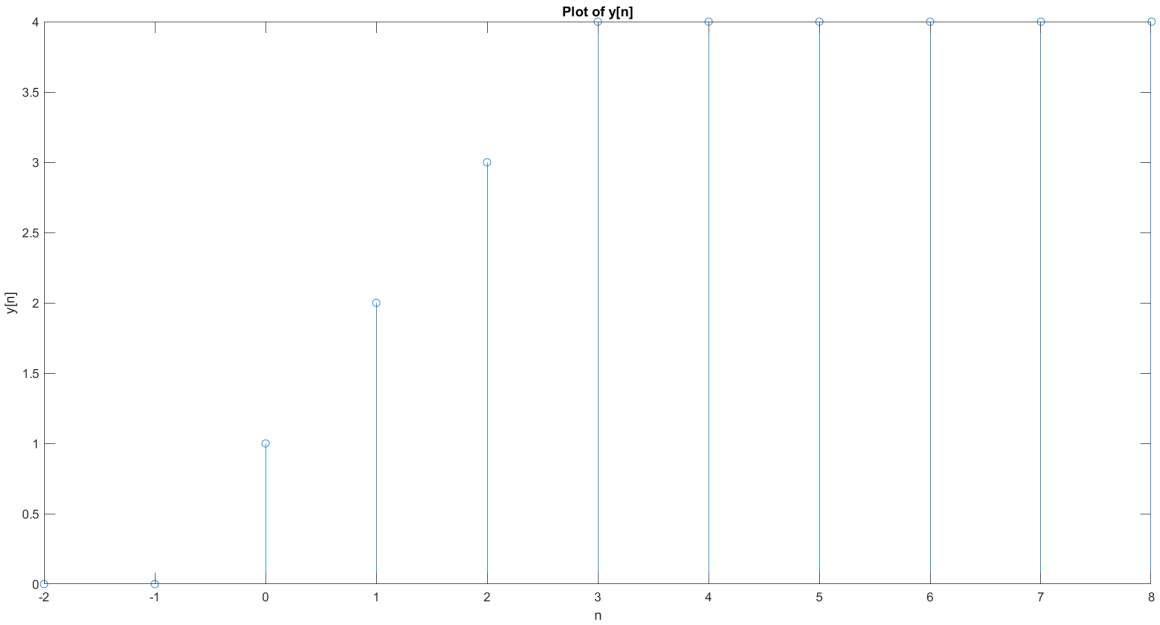
Since $x[n]$ is a unit step signal it is zero for t<0.

Hence, $y[-2], y[-1]$ are equal to 0.

$y[0] = 1, y[1] = 2, y[2] = 3, y[3] = 4.$

$y[4] = y[5] = y[6] = y[7] = y[8] = 4.$

(b) Plot of output y[n]:



(c) Formula for $y[n]$ that applies for any length L :

From the pattern of outputs obtained in (a),

$y[n] = 0$ for $n < 0$

$y[n] = n + 1$ for $0 \leq n < L$

$y[n] = L$ for $n \geq L$