

## PROBLEM:

Evaluate the “running” average:

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

for a specific input signal—a signal that turns on at  $n = 0$ . This is called the *unit step* signal, and is usually denoted by  $u[n]$ .

$$x[n] = u[n] = \begin{cases} 0 & \text{for } n < 0 \\ 1 & \text{for } n \geq 0 \end{cases}$$

- Make a plot of  $u[n]$  before working out the answer for  $y[n]$ .
- Now compute the numerical values of  $y[n]$  over the range  $-5 \leq n \leq 10$ , assuming that  $L = 5$ .
- Make a sketch of the output for both over the range  $-5 \leq n \leq 10$ , assuming that  $L = 5$ . Use MATLAB if necessary, but learn to do it by hand also.
- Finally, derive a general formula for  $y[n]$  that will apply for any length  $L$  and for the index range  $n \geq 0$ .