PROBLEM:

Consider the following cascade system:

$$x[n] \longrightarrow \begin{array}{c} \text{LTI} \\ \text{System #1} \\ H_1(z) \end{array} \longrightarrow \begin{array}{c} w[n] \\ H_2(z) \end{array} \longrightarrow \begin{array}{c} y[n] \\ \end{array}$$

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

where

$$H_1(z) = 2 - z^{-1} - z^{-2}$$
 and $H_2(z) = 1 + \frac{1}{2}z^{-1}$

(a) If the input x[n] is a step,

Find the output of the **first filter**,
$$w[n]$$
.

(b) Find and plot the impulse response h[n] of the overall system.