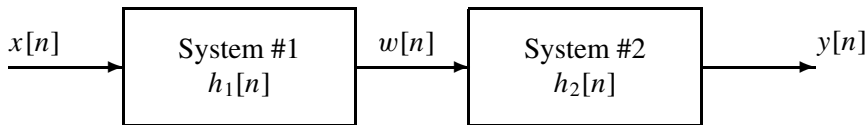


**PROBLEM:**

Shown in the figure below is a cascade of two linear time-invariant systems with impulse responses  $h_1[n]$  and  $h_2[n]$ .



The impulse responses of the two systems are

$$h_1[n] = \delta[n] - \frac{1}{4}\delta[n - 1] \quad h_2[n] = (0.75)^n u[n]$$

- If  $x[n] = 2\delta[n] - \delta[n - 1]$ , find the output of the first system,  $w[n]$ .
- Determine the system function  $H(z)$  for the cascade of the two systems. In other words, if  $y[n] = x[n] * h[n]$ , what is  $H(z)$ ?
- Make a plot of the poles and zeros of  $H(z)$  in the  $z$ -plane, where  $H(z)$  is the system function found in part (b).
- If  $x[n] = \delta[n] - (0.75)\delta[n - 1]$ , find the output of the cascade,  $y[n]$ .