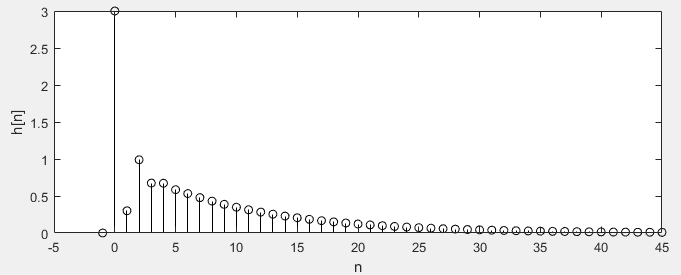
**5.8-2** Consider a system with impulse response . Determine this system’s time constant, rise time, and pulse dispersion. Identify, if possible, an input *x*[*n*] that will cause this system to resonate.

**Time Constant)**

Here is h[n] plotted



The n=0 value seems out of place… so I’m going to ignore it. I’m going to choose my at where the amplitude is 1% of the peak height of h[n] (still disregarding 3 at n=0). This will be where h[n] = ~0.01, or at n = 44

Then, the width is:

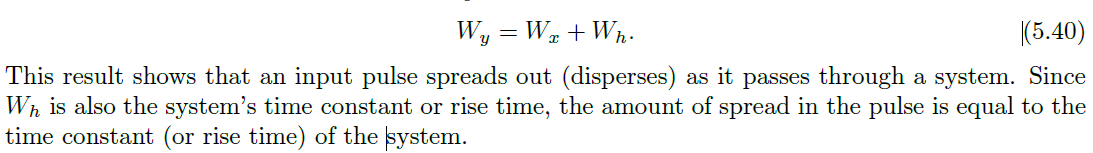
**Rise Time)**

According to eq. 5.39 the rise time is just equal to the time constant



**Pulse Dispersion)**

According to the book, the pulse dispersion width is equal to the time constant as well



**An input x[n] that resonates with this system)**

From pg. 316 in the book:

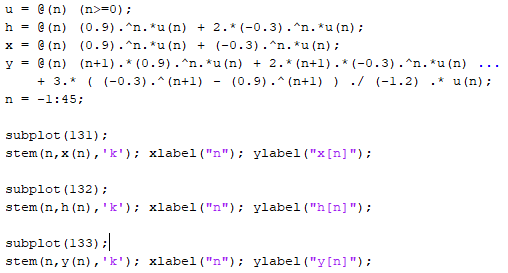
If

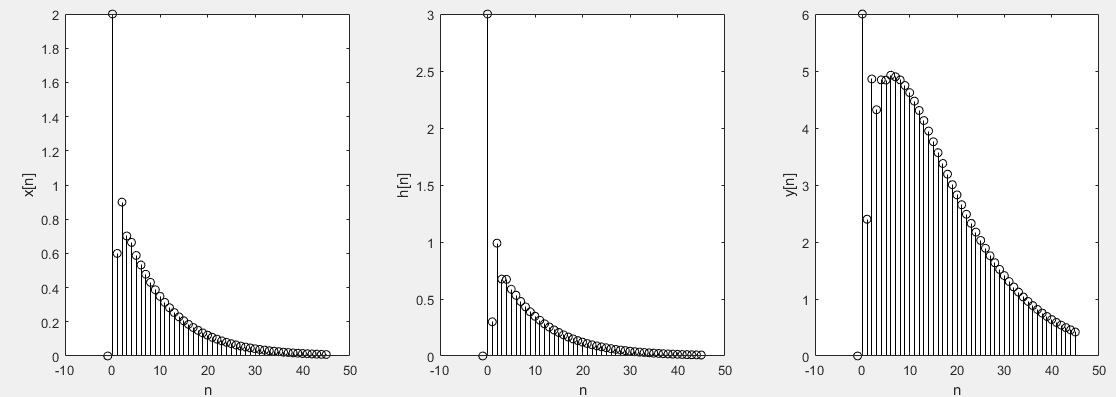
Then as

If we have an input such that . Where,

Then, our

Or in MATLAB,





It goes to zero, but in our y[n] we can see that there the (n+1) term will go to infinity as n goes to infinity. This output will decay before that can go to infinity since its roots are within the unit circle, but it still resonates with the system.