

## PROBLEM:

The diagram in Fig. 1 depicts a *cascade connection* of two linear time-invariant systems; i.e., the output of the first system is the input to the second system, and the overall output is the output of the second system.

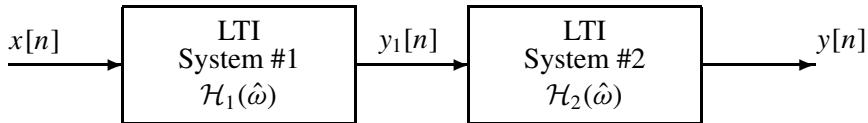


Figure 1: Cascade connection of two LTI systems.

- (a) Suppose that System #1 is described by the difference equation  $y_1[n] = x[n] + x[n - 2]$ , and System #2 is described by the frequency response function  $\mathcal{H}_2(\hat{\omega}) = (1 - e^{-j2\hat{\omega}})$ . Determine the frequency response function of the overall cascade system.
- (b) Obtain a single difference equation that relates  $y[n]$  to  $x[n]$  in Fig. 1.