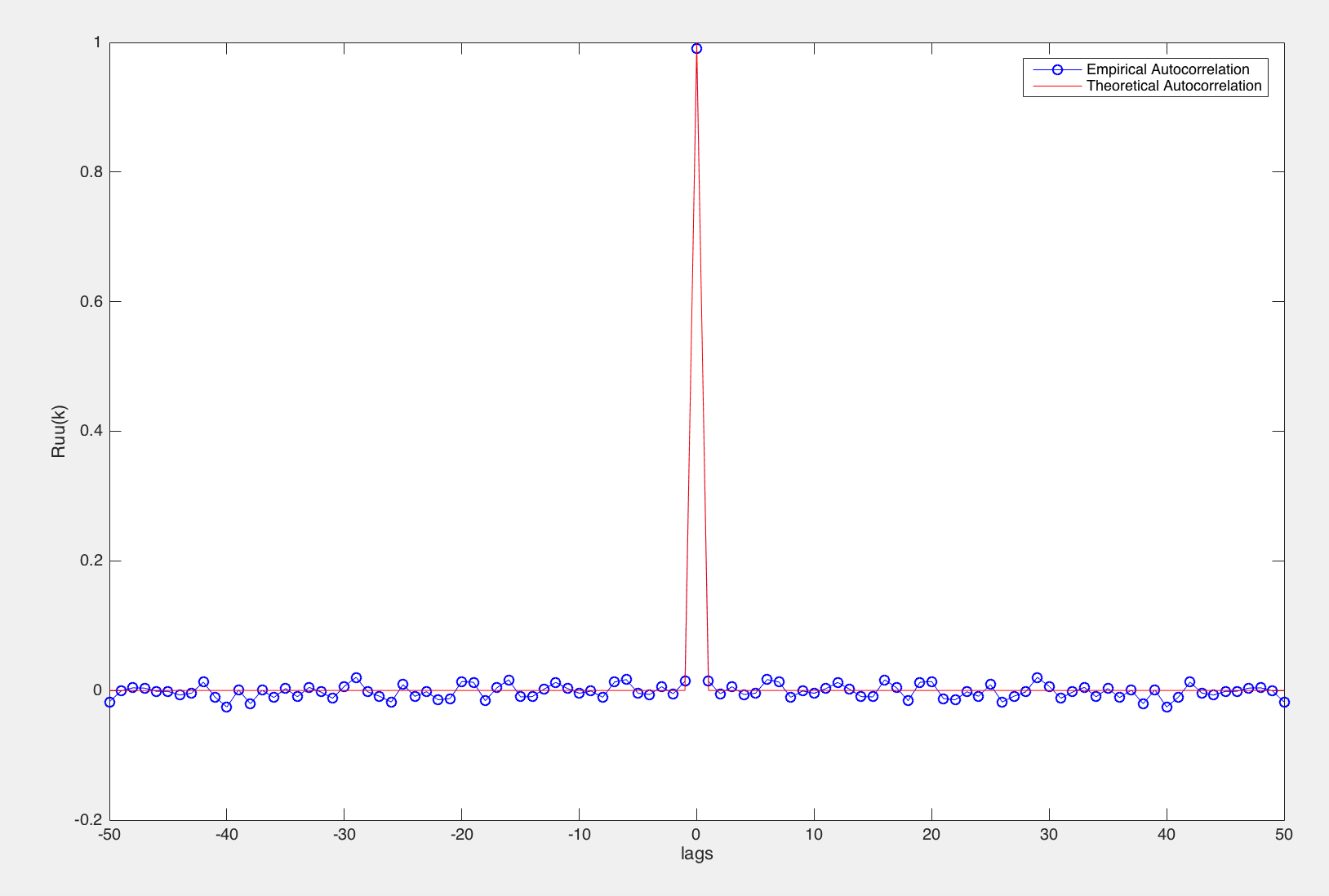
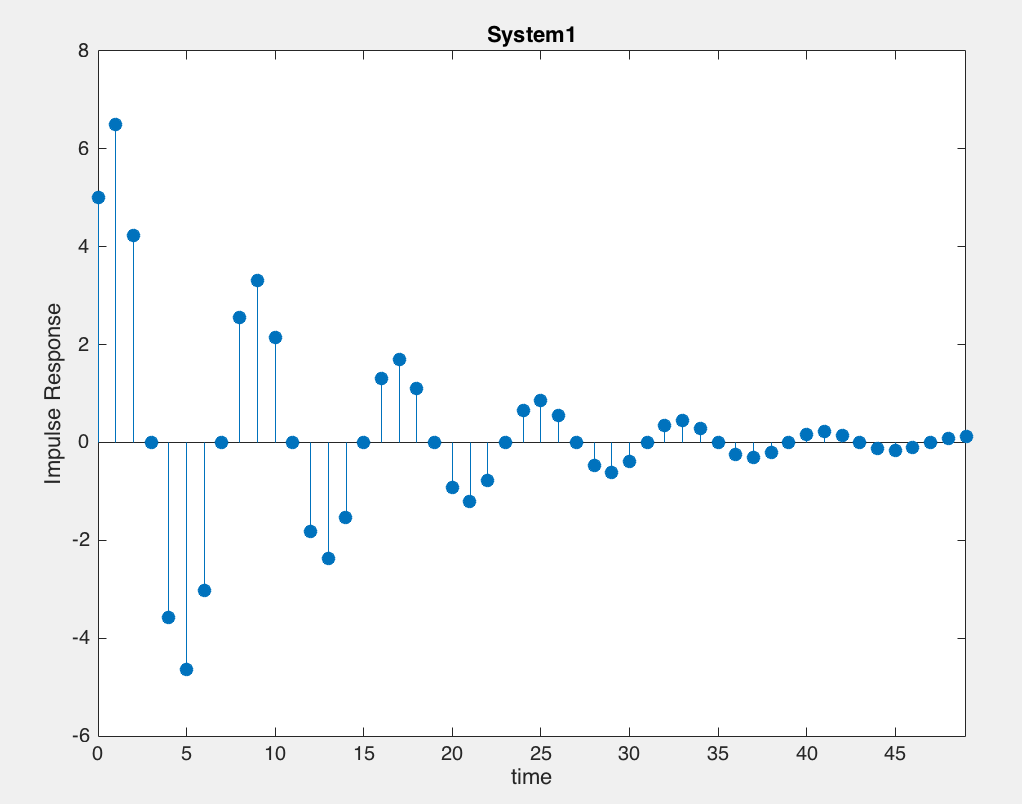
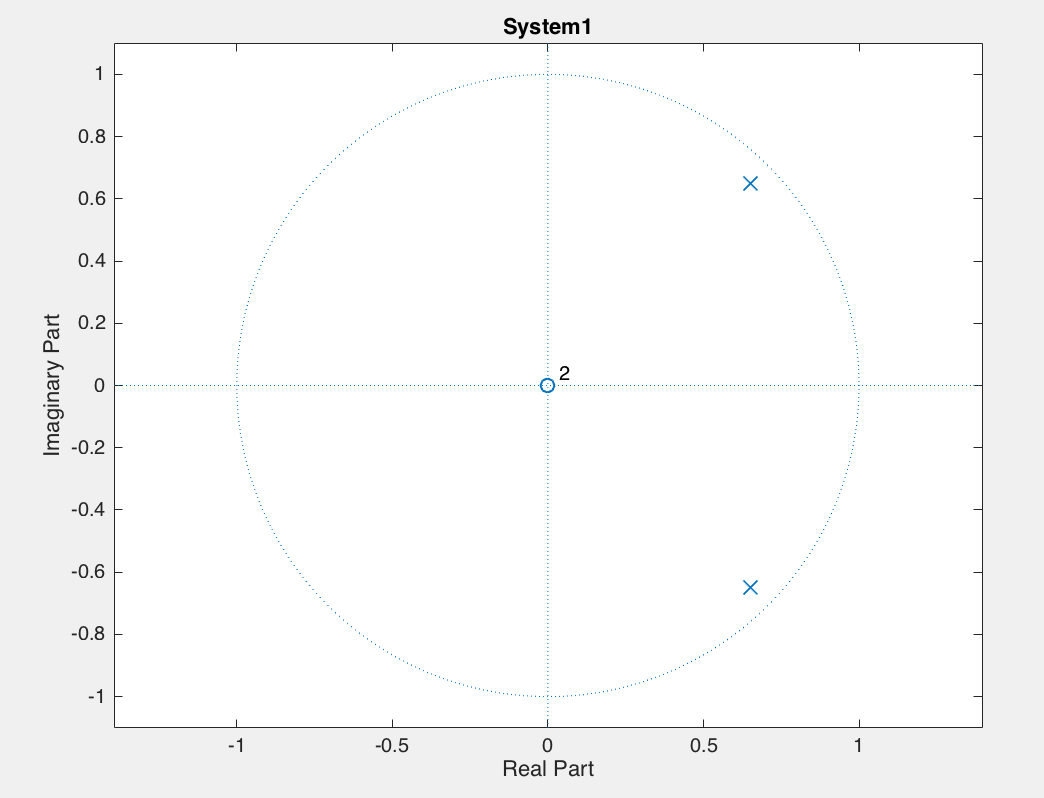
**Problem Set 5**

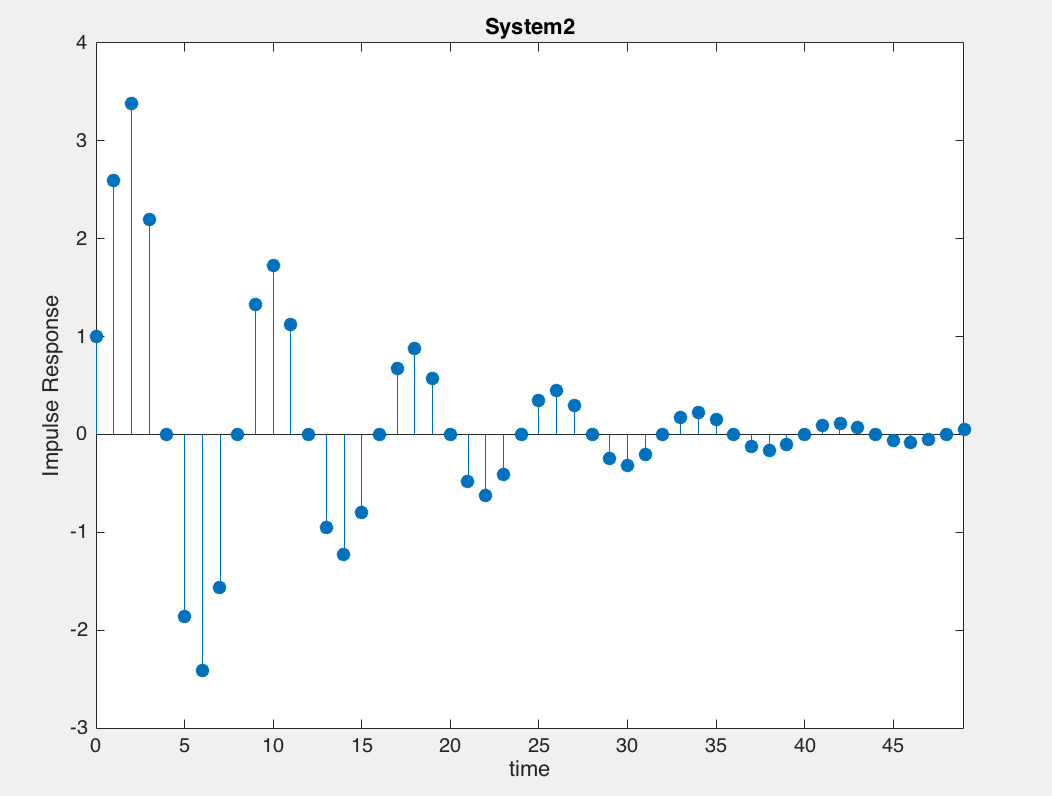
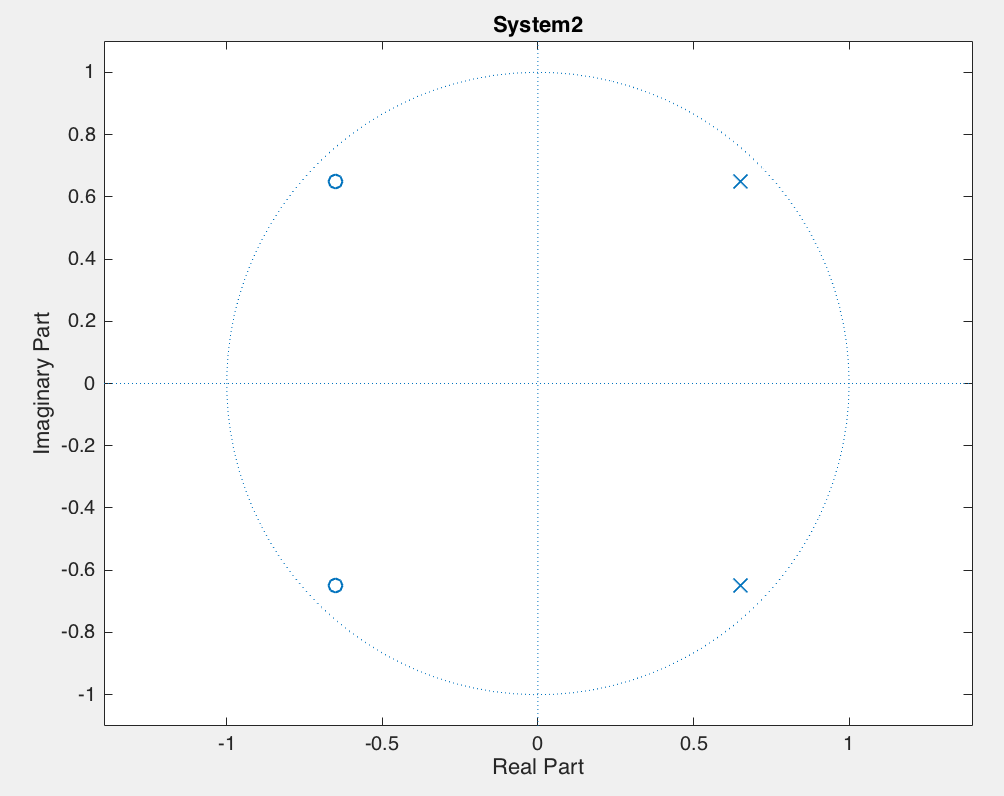
**Problem 5.9**

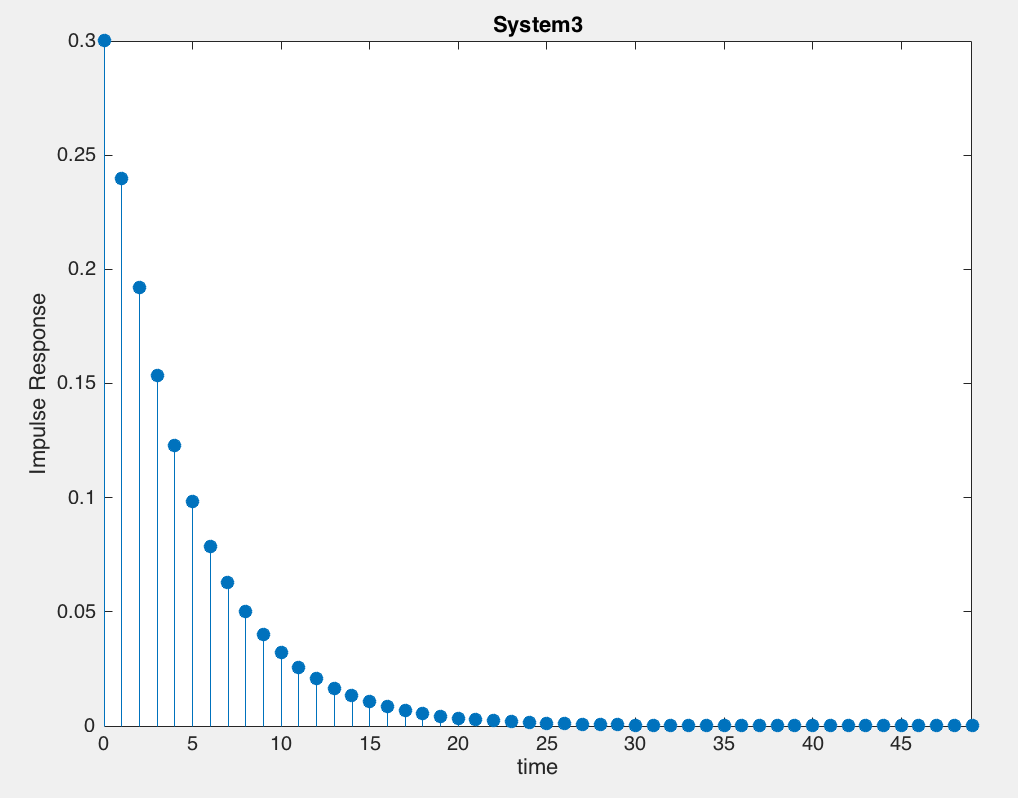
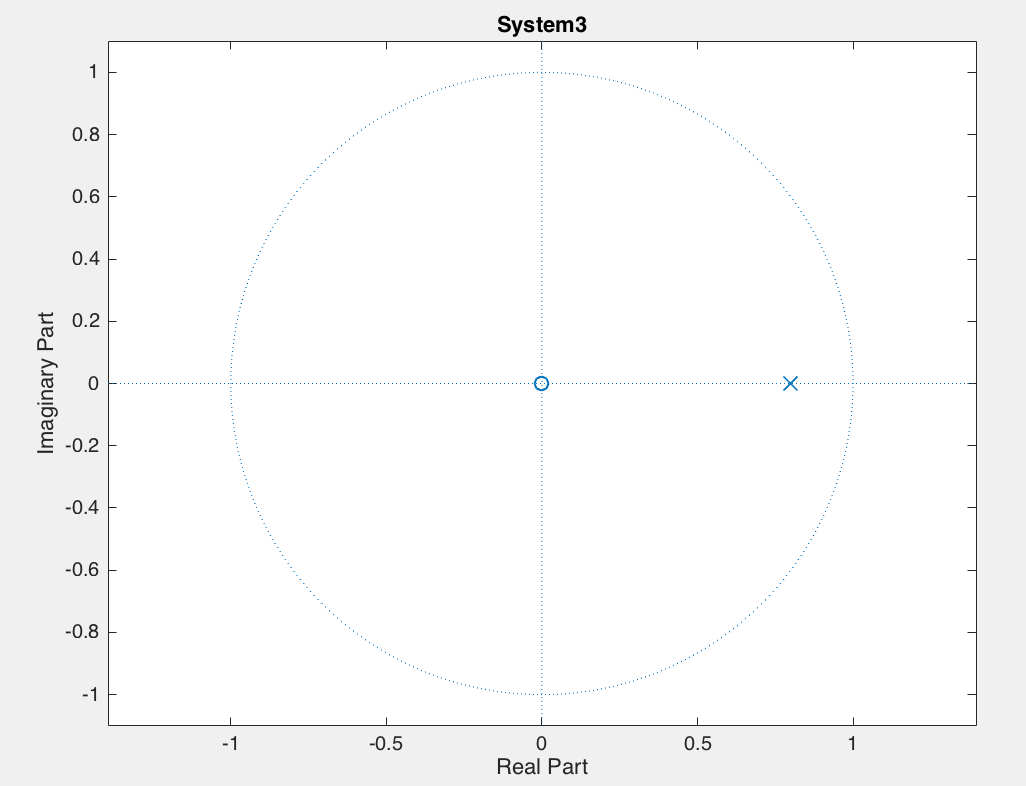
a.

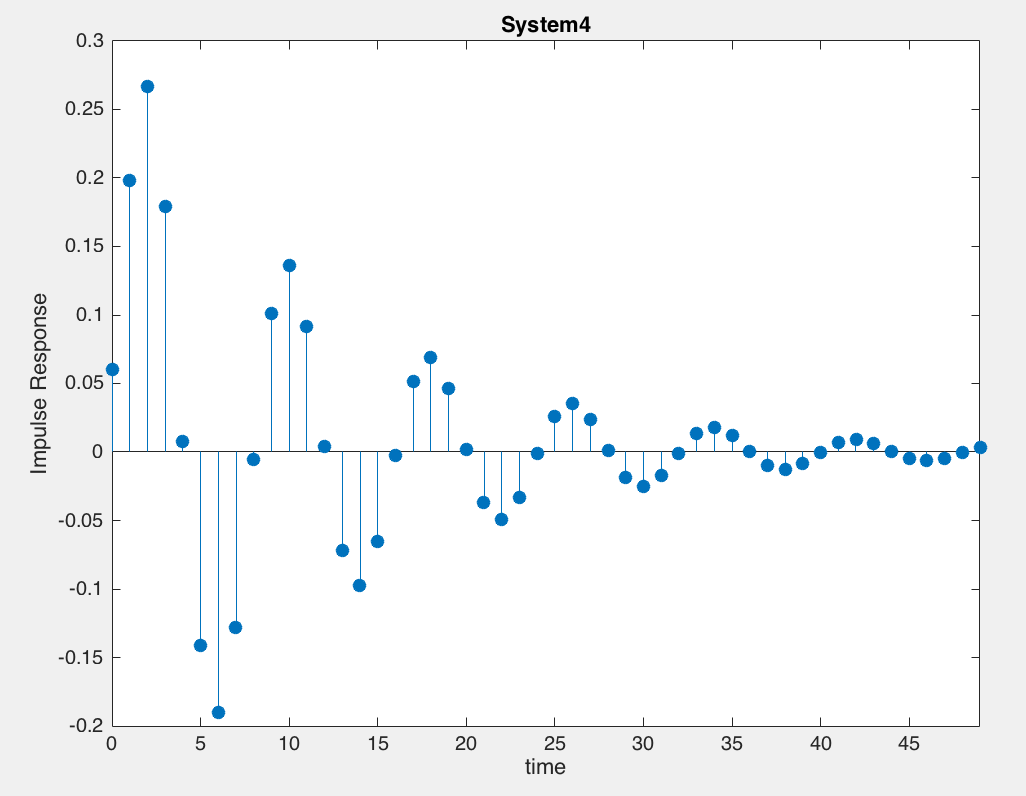
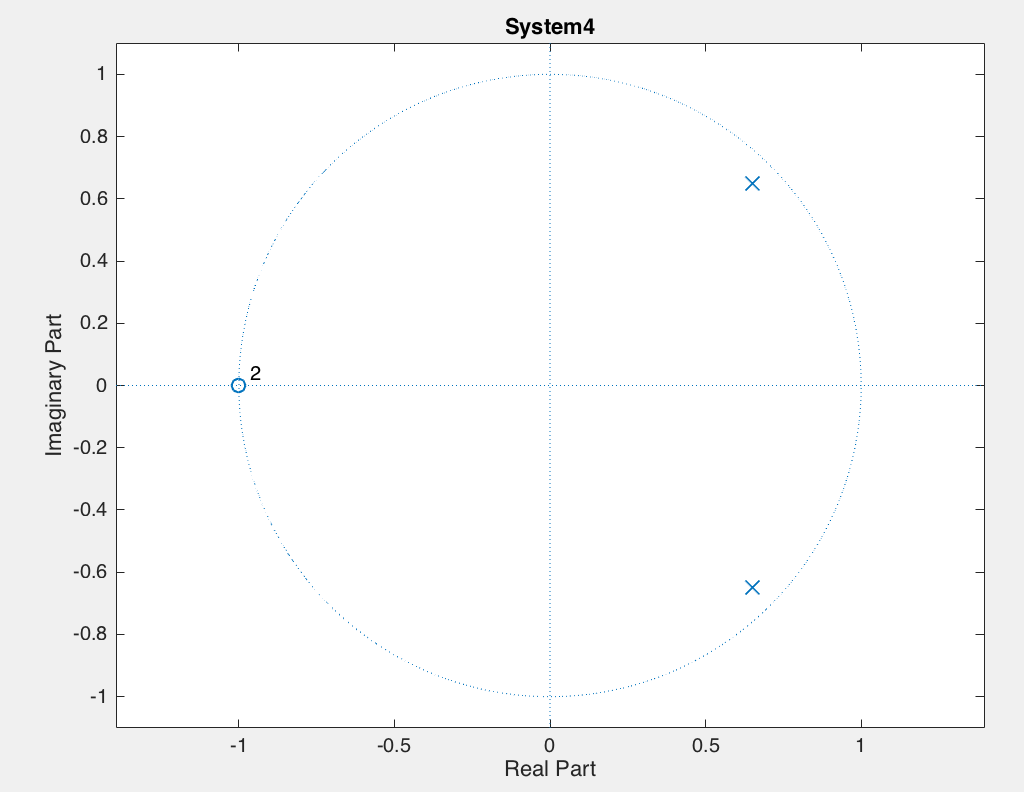


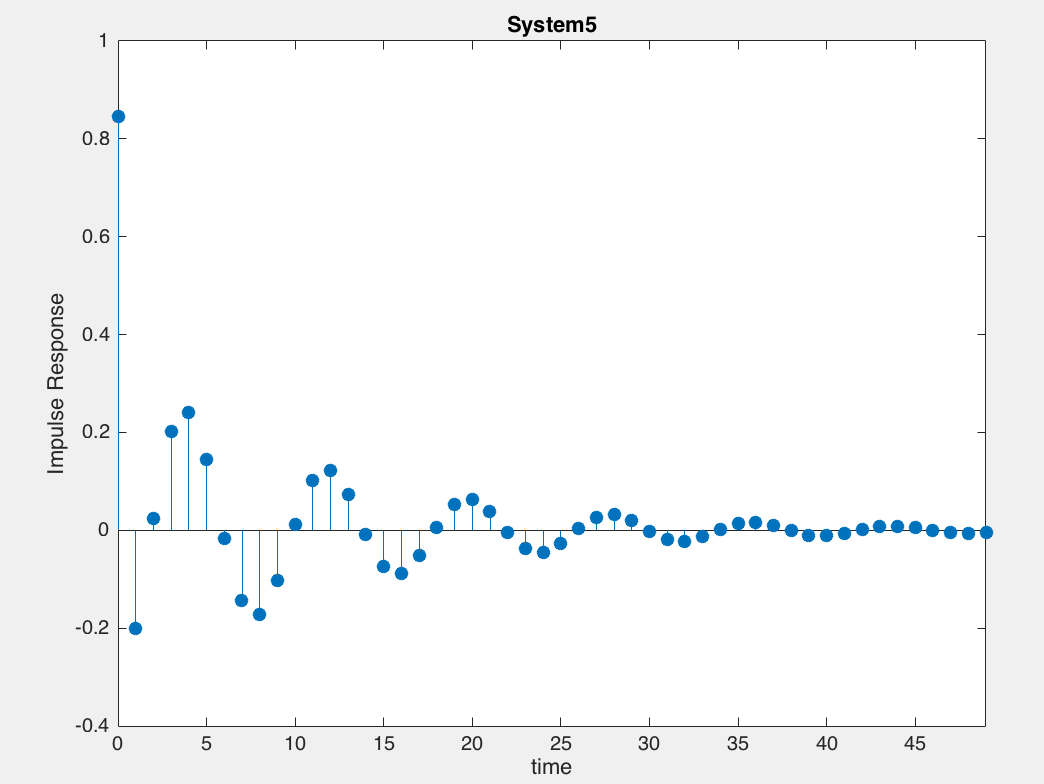
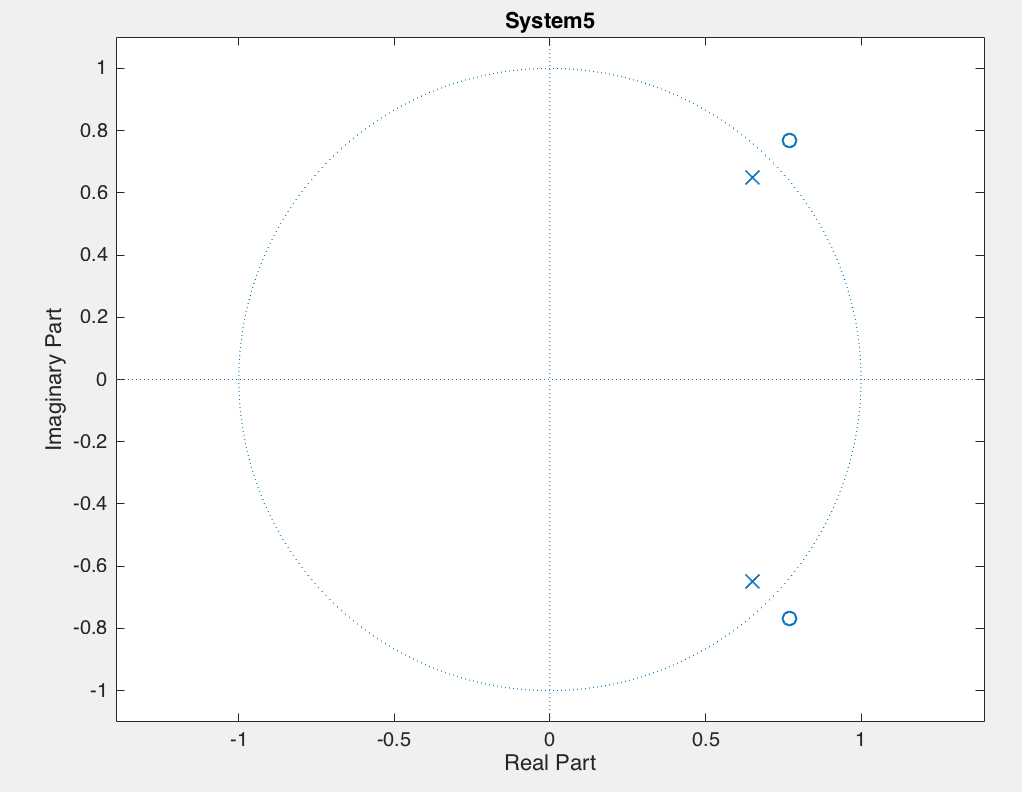
b. Impulse responses of systems and their zeros and poles

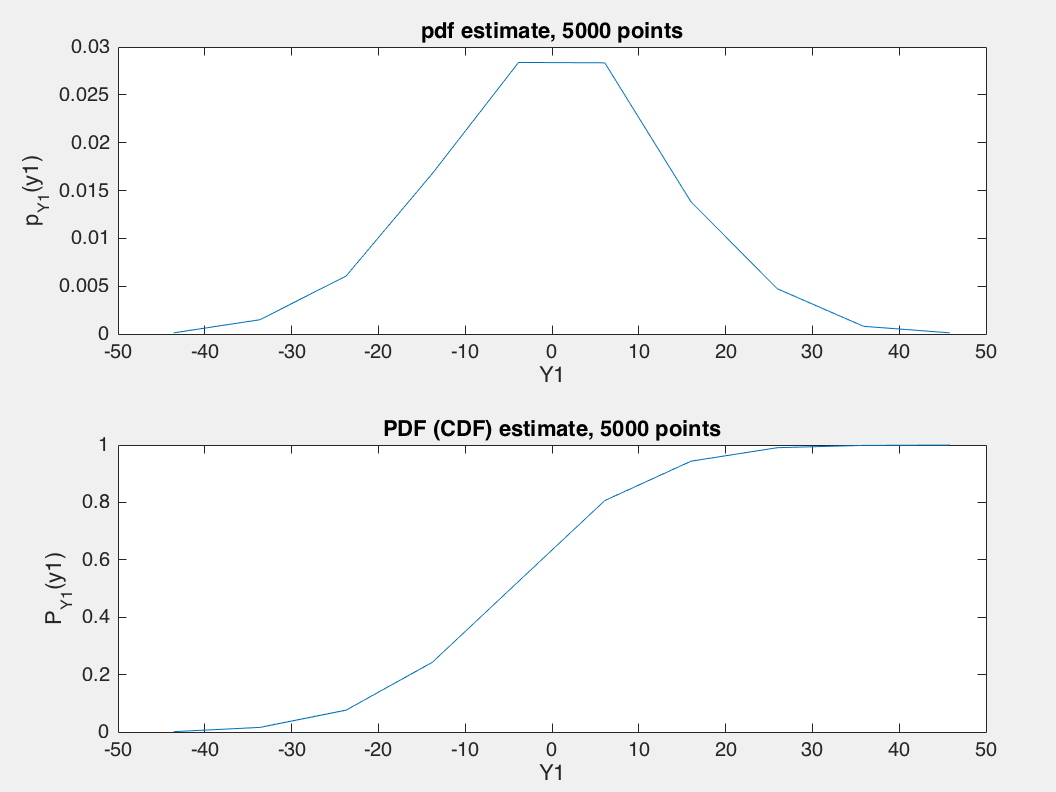
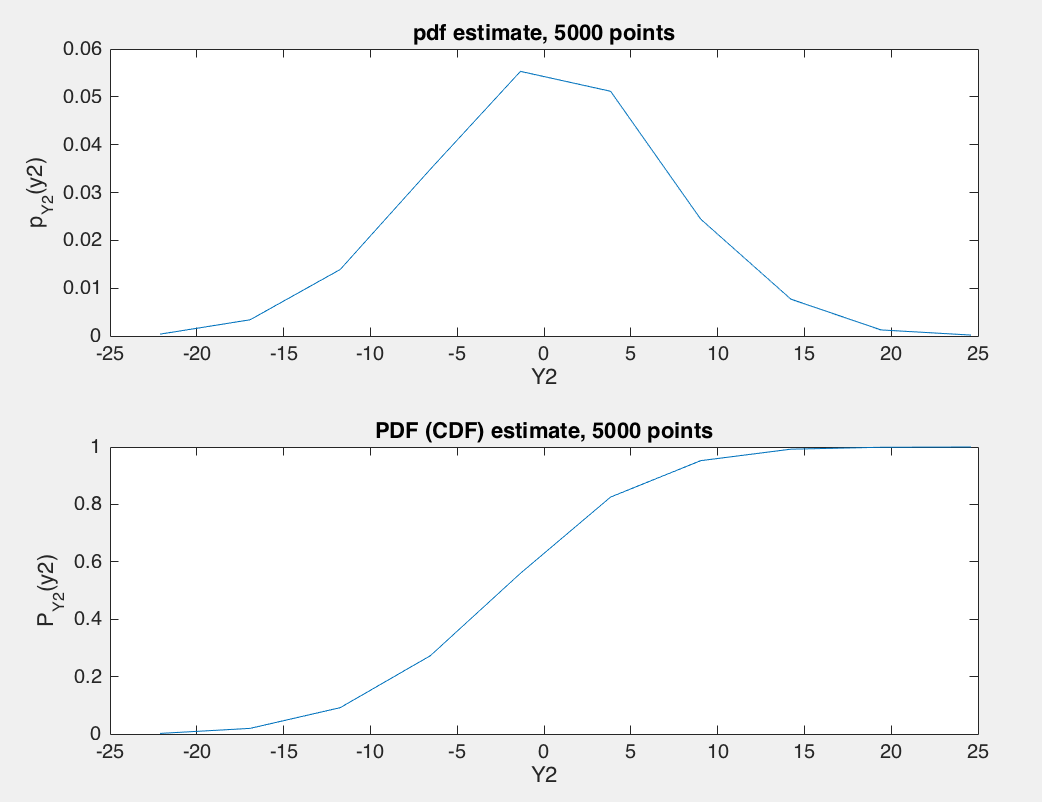
 

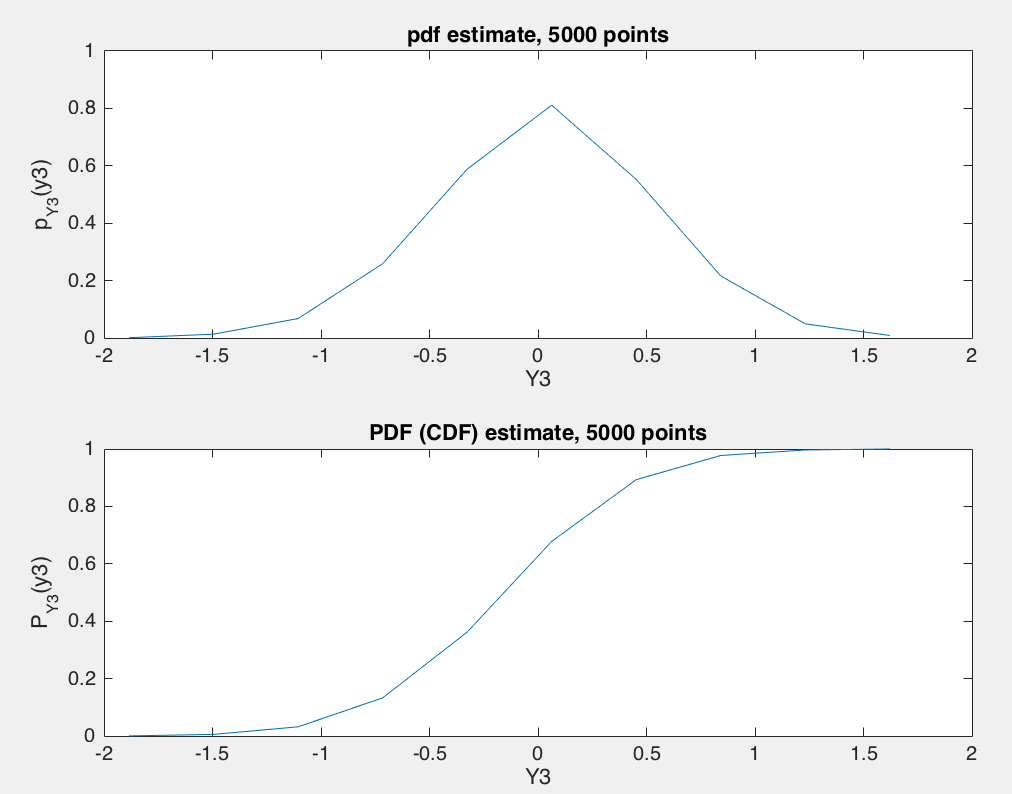
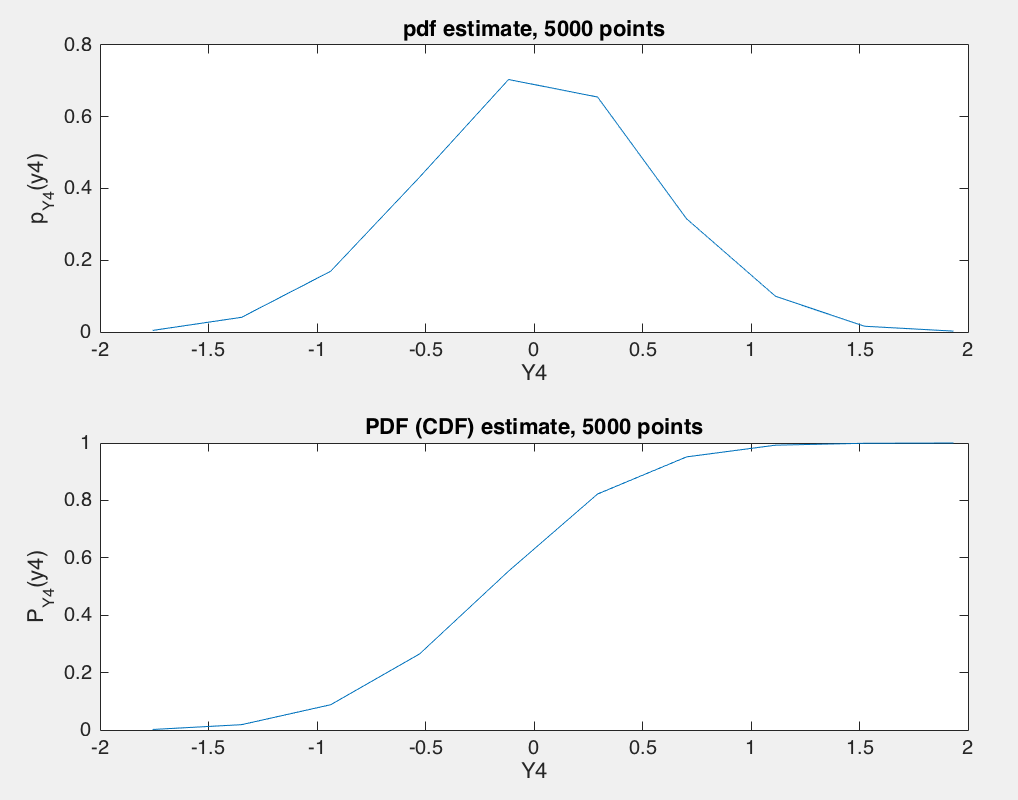
 

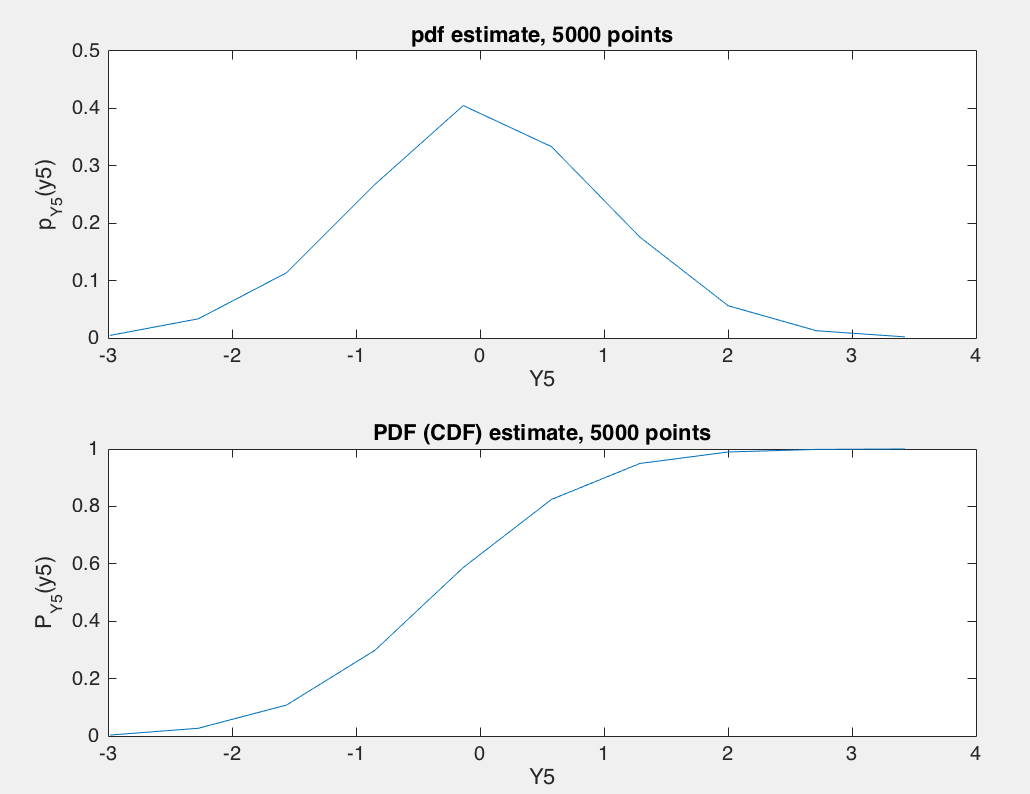
 

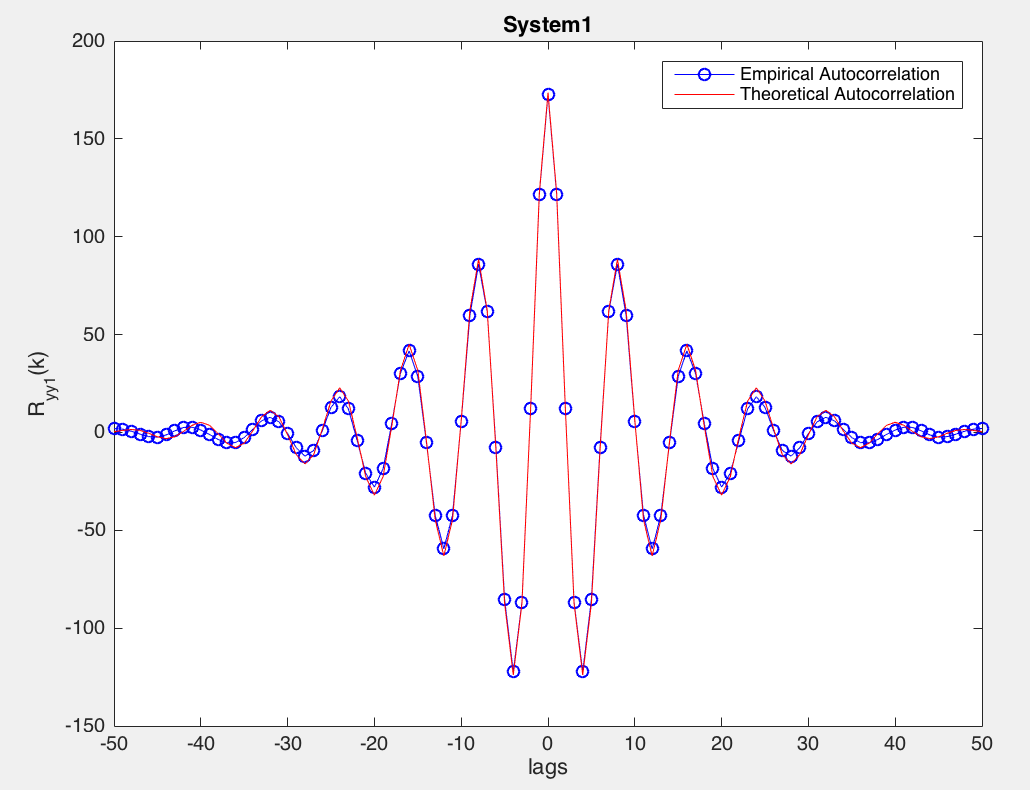
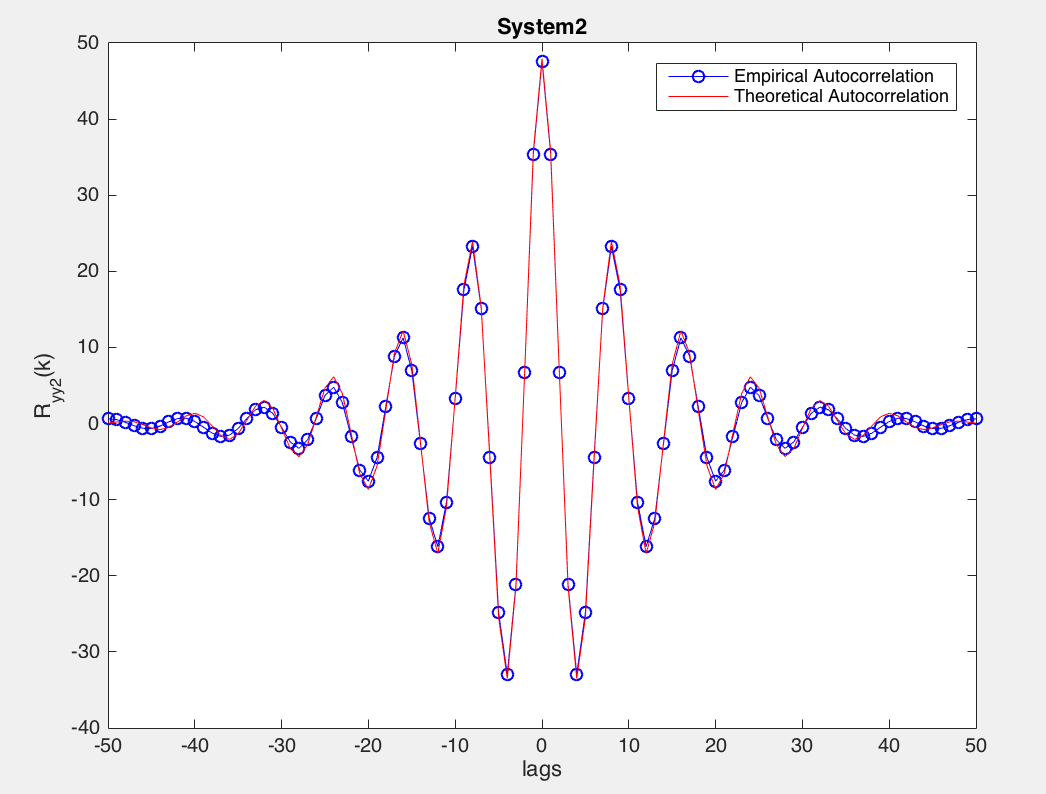
c. pdfs of outputs after inputting white noise through 5 LTI systems

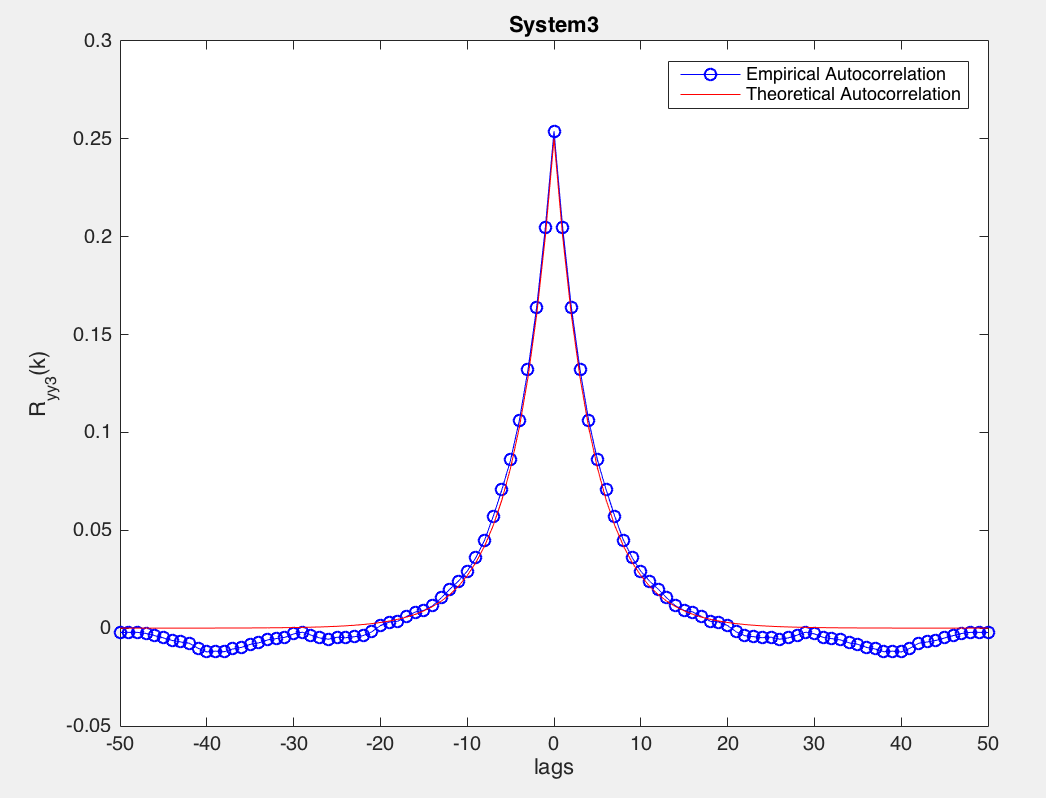
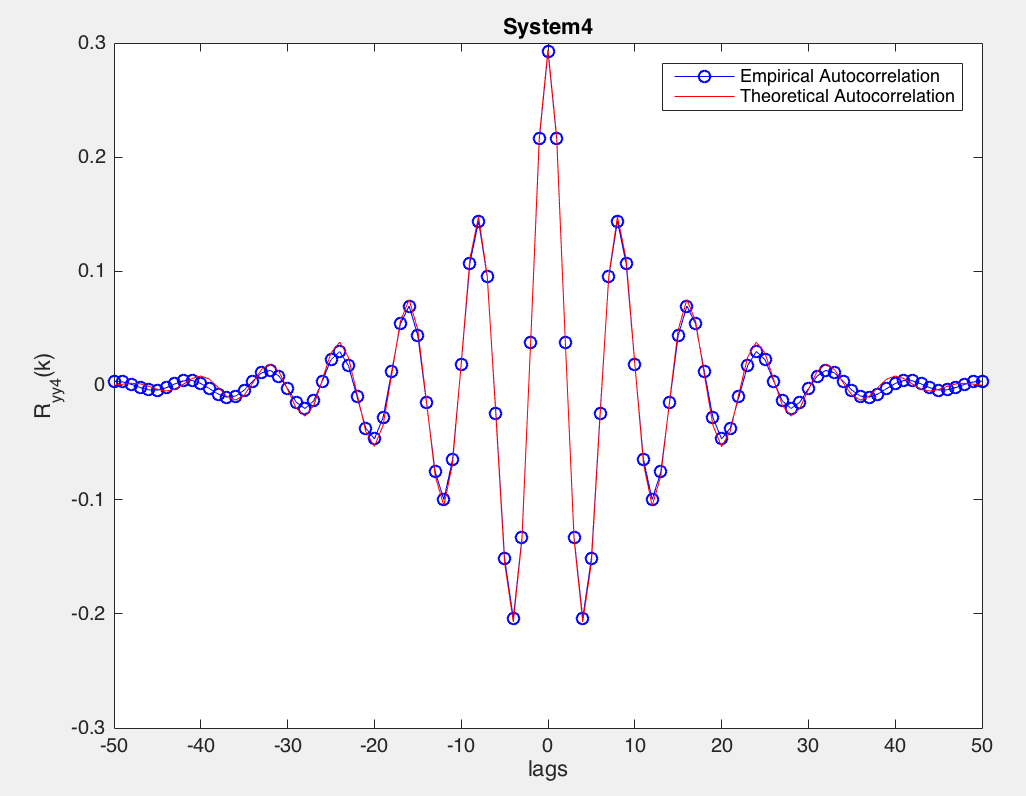
 

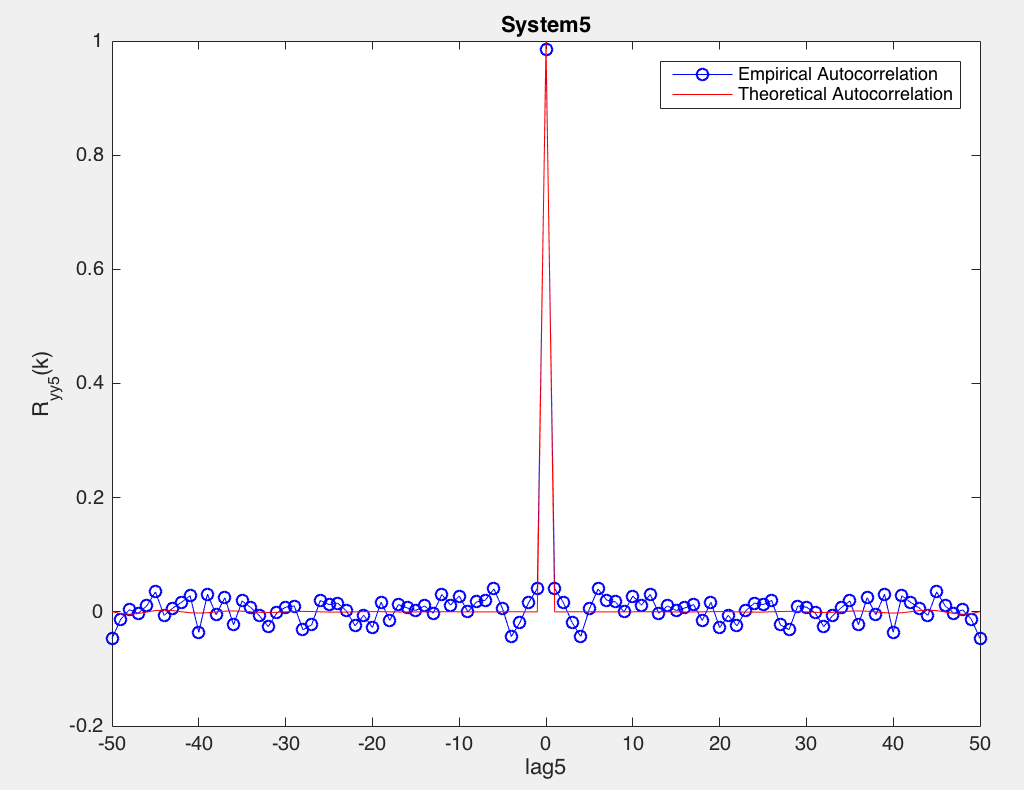
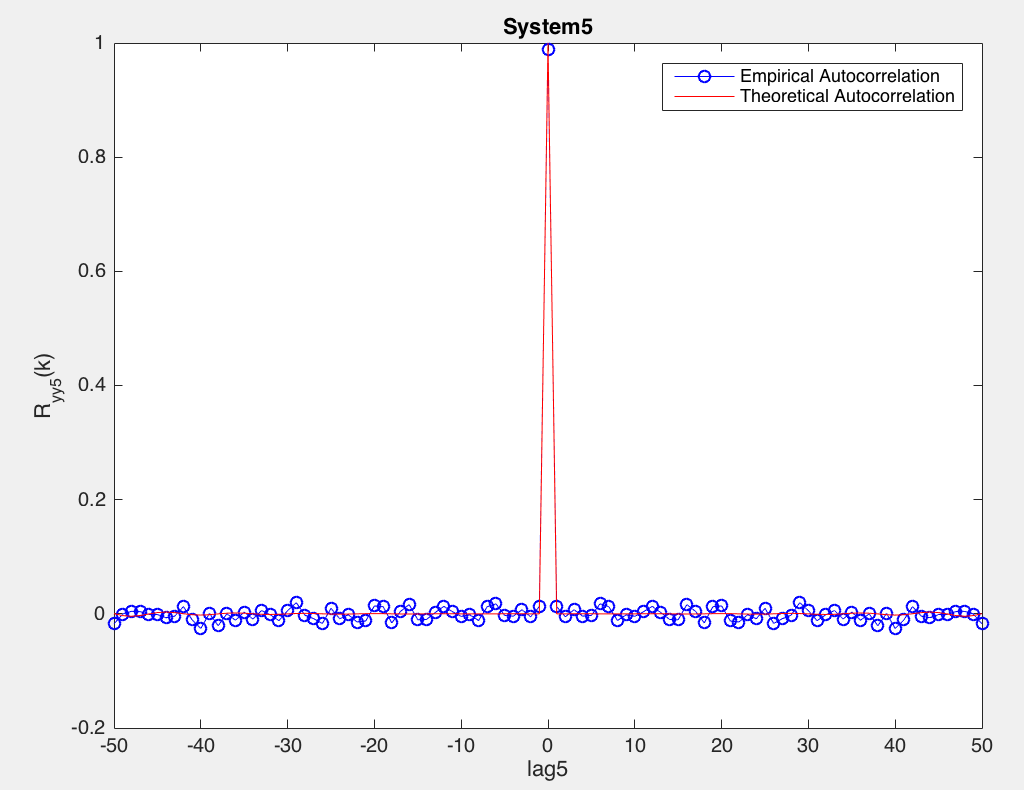
 



d. Comparing empirical and theoretical autocorrelations of outputs from 5 systems

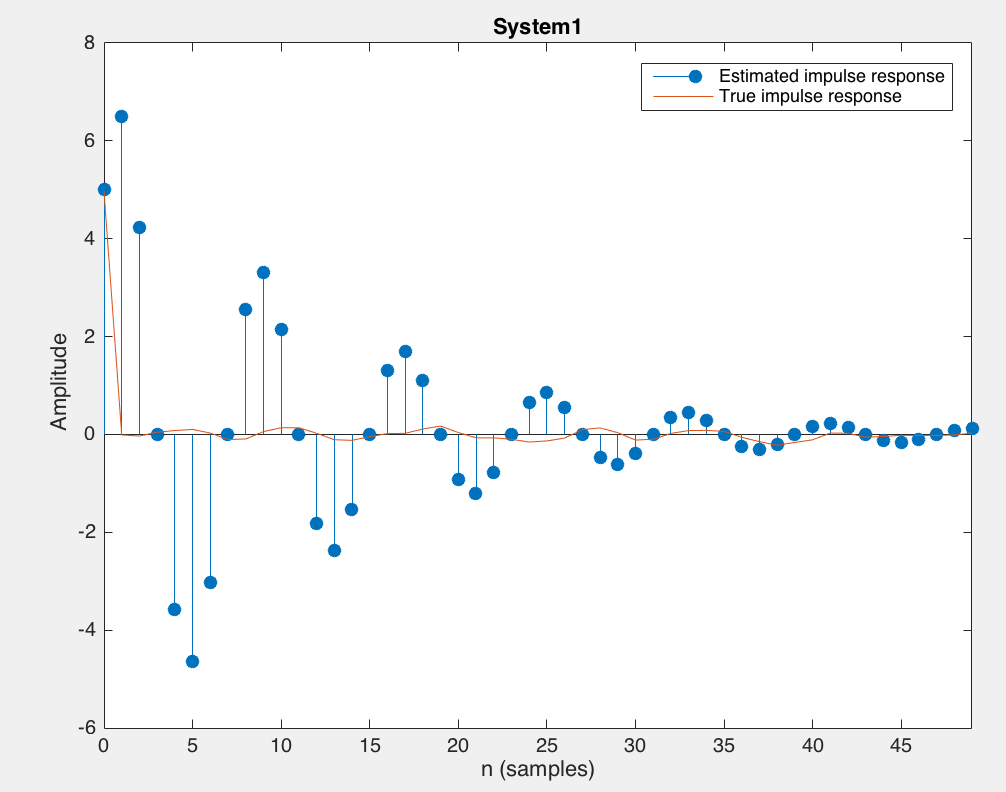
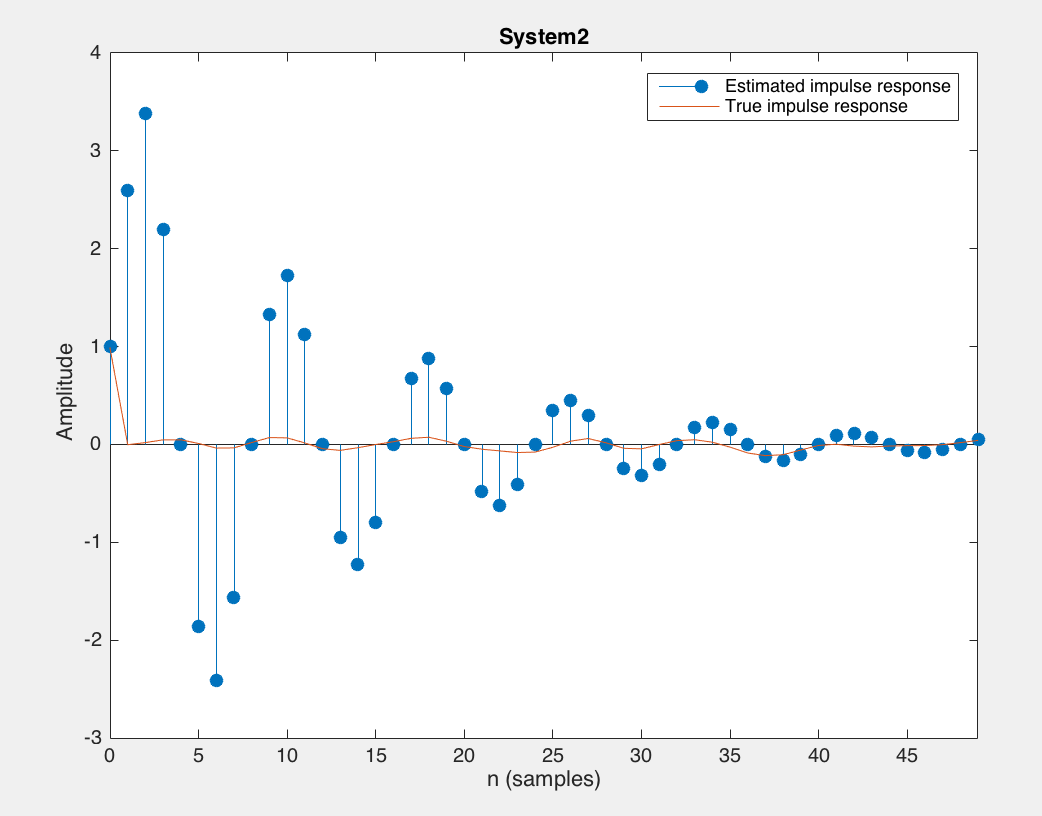
 

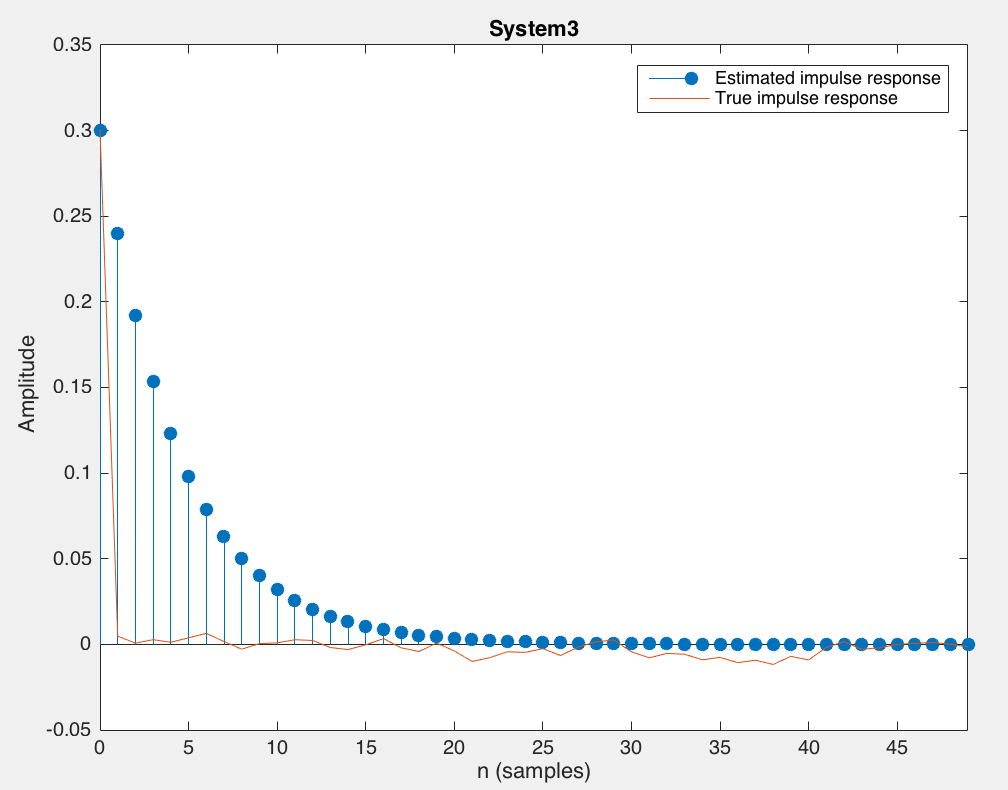
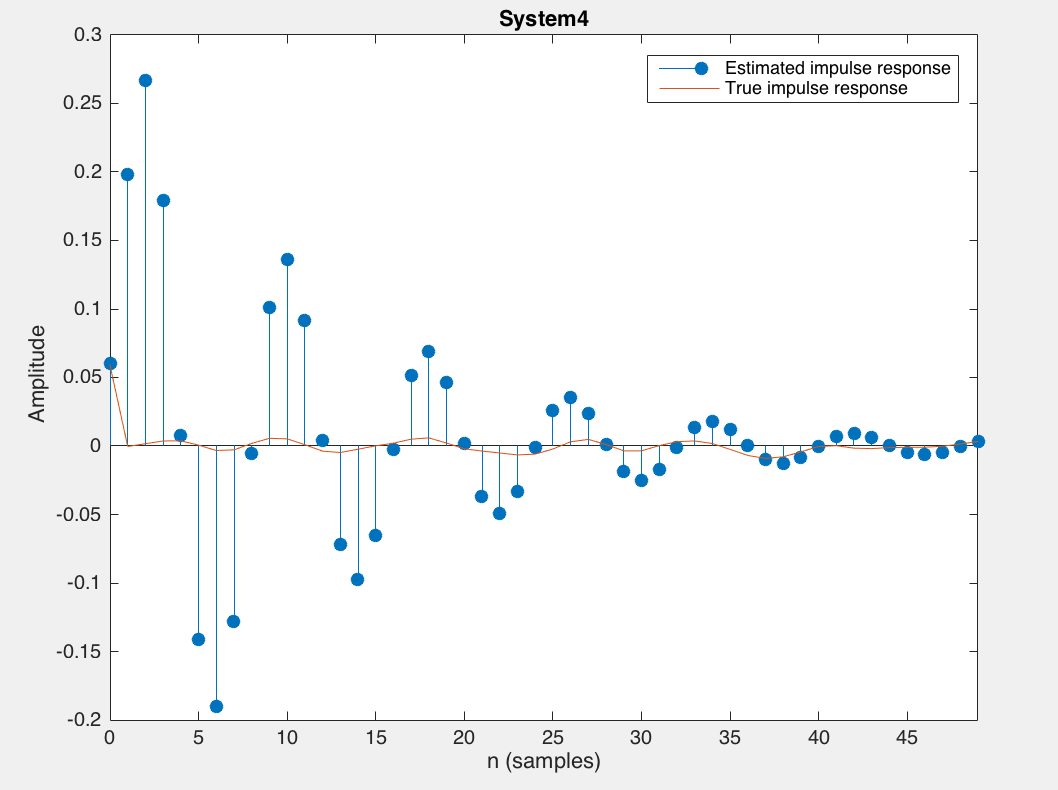
Autocorrelation estimates are very sensitive to data length. The noise in autocorrelation increases if only half the data is used seen in the figure (left) above and doesn’t match the theoretical autocorrelation very well.

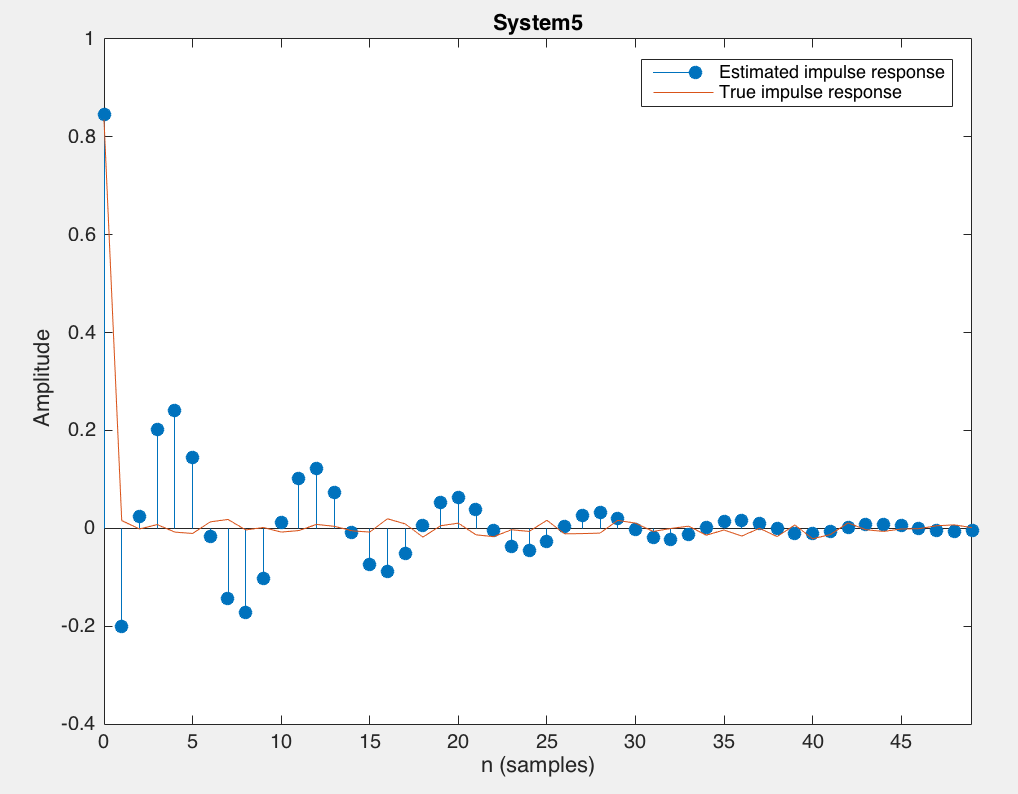
Less number of samples are averaged if larger lag values are used. Therefore it won’t match the theoretical autocorrelation very well.

Even if the white noise is uniformly distributed, Ruu(k) will be the same.

e. Comparing impulse responses of 5 systems

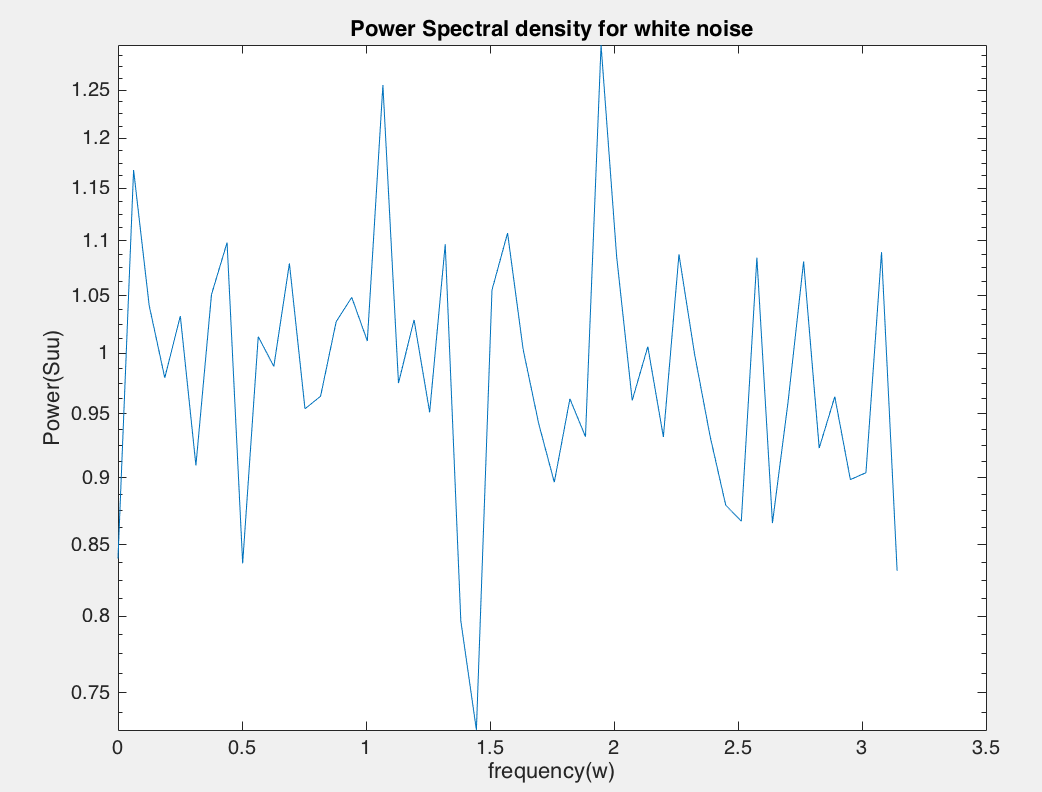
 

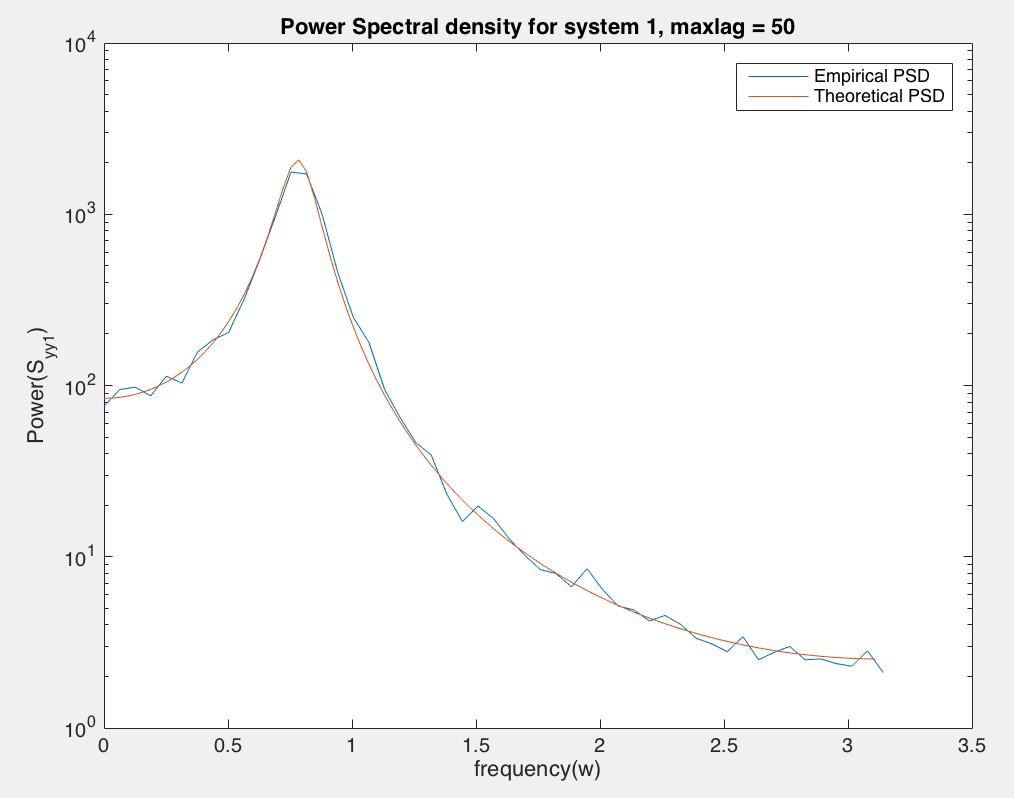
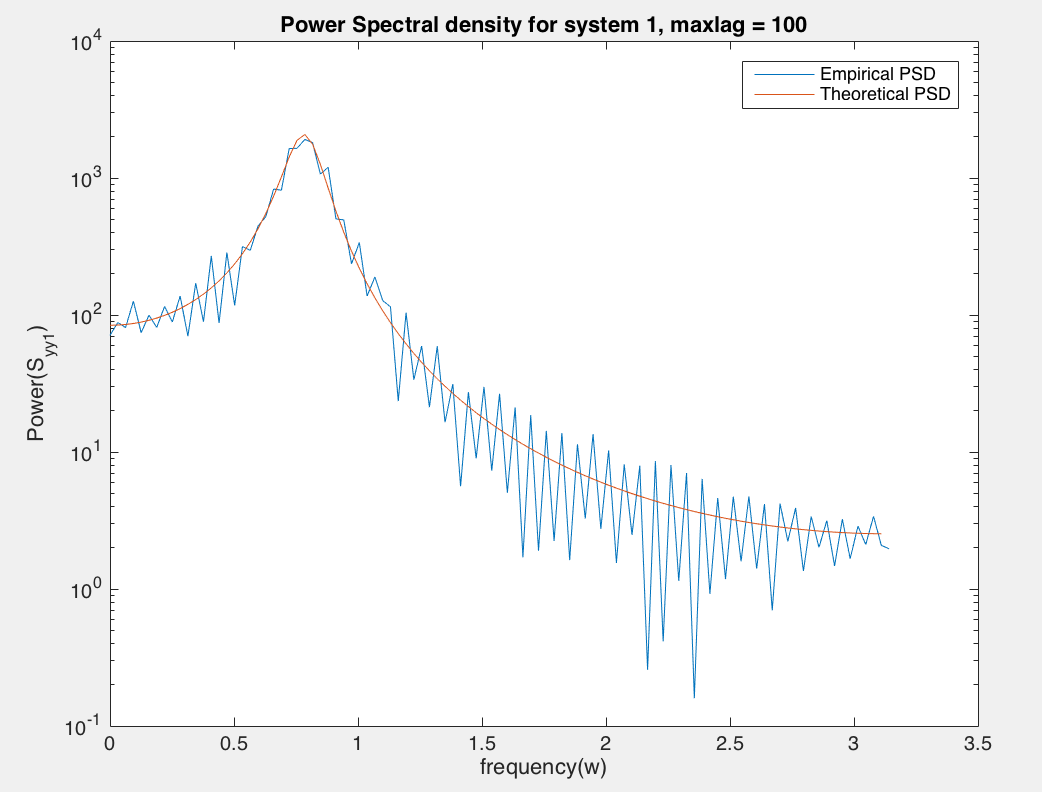


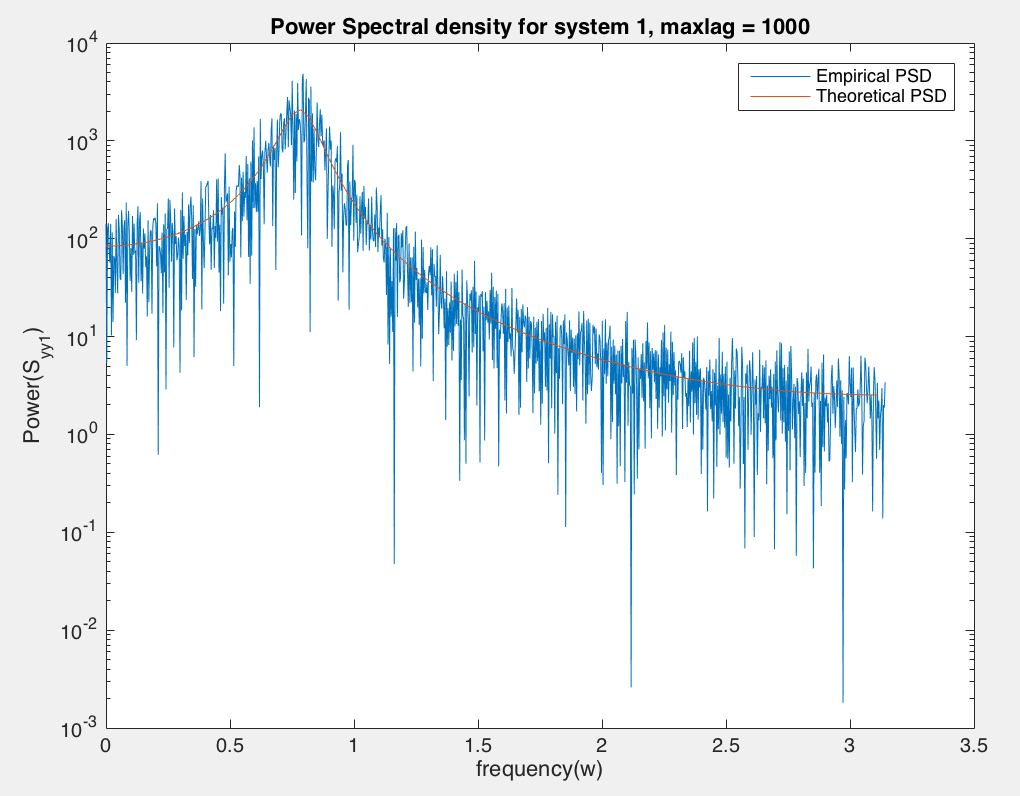
Problem 5.10

a. Power Spectral Density for white noise



b. Empirical PSD for outputs of 5 LTI systems compared with theoretical PSDs.



As maxlag is increased, noise increases in PSD for the system. Empirical PSD doesn’t match the theoretical PSD very well as the maxlag increases.

