

Homework #5

Time and Frequency Responses of FIR Filters

Assigned on Friday, October 9, 2026

Due on Friday, October 16, 2026, by 11:59 pm via Gradescope.

*Late homework is subject to a penalty of two points per minute late.***Reading:** McClellan, Schafer & Yoder, *Signal Processing First*, 2003, Sec. 5.4-5.9 and 6.1-6.6.See the book's [companion Web site](#) for demos and other supplemental information.

Web site contains solutions to hundreds of worked problems.

E-mail address for Ms. Alice Liu (TA) is alicieliu98@utexas.edu. Please consider posting questions on the class [Ed Discussion site](#), which can be answered by anyone in the class. You can post anonymously to the other students and to the instructors.

<i>Time Slot</i>	<i>Monday</i>	<i>Tuesday</i>	<i>Wednesday</i>	<i>Thursday</i>	<i>Friday</i>
11:00 am		Evans (ECJ 1.214)		Evans (ECJ 1.214)	
11:30 am		Evans (ECJ 1.214)		Evans (ECJ 1.214)	
12:00 pm		Evans (ECJ 1.214)		Evans (ECJ 1.214)	
12:30 pm					
1:00 pm					
1:30 pm					
2:00 pm		Evans (EER 6.882 and Zoom)			Liu (EER 6.702 and Zoom)
2:30 pm		Evans (EER 6.882 and Zoom)			Liu (EER 6.702 and Zoom)
3:00 pm		Evans (EER 6.882 and Zoom)	Liu (EER 5.704 and Zoom)	Liu (EER 5.704 and Zoom)	Liu (EER 6.702 and Zoom)
3:30 pm		Evans (EER 6.882 and Zoom)	Liu (EER 5.704 and Zoom)	Liu (EER 5.704 and Zoom)	Liu (EER 6.702 and Zoom)
4:00 pm			Liu (EER 5.704 and Zoom)	Liu (EER 5.704 and Zoom)	
4:30 pm			Liu (EER 5.704 and Zoom)	Liu (EER 5.704 and Zoom)	

[ECE 313 tutoring](#) is available Mondays, Tuesdays, and Wednesdays 7-10pm in person in EER 0.814.

As stated on the course descriptor, "Discussion of homework questions is encouraged. Please be sure to submit your own independent homework solution."

Please submit all Matlab code and plots for your solution to these problems.

NOTE: In your solutions, please put all work for problem 1 together, then all work for problem 2 together, etc. Please see additional homework guidelines on the homework page.

1. Averaging Filter and the Unit Step Signal. 28 points.

Signal Processing First, problem P-5.6, page 127.

2. System Properties. 24 points.

Signal Processing First, problem P-5.9, page 128.

3. System Properties and Deconvolution. 24 points.

Signal Processing First, problem P-5.12, page 128. When working the problem, assume that you do not know the filter coefficients. Using system properties to find the answer. This will be part (a).

For part (b), use the deconvolution formulas in homework problem 4.3(a) to manually determine the FIR filter coefficients given that the input signal is $x_1[n]$ and the output signal is $y_1[n]$ for $n \geq 0$. Check your calculations using [utdeconvolve.m](#) provided on the [tuneup page](#). When running the code, use an equal number of input and output values for vectors x and y, which is what would happen in an experimental setup that would input a test signal x and observe the output y. Please see the comments in the code for more info. Check your answer for the filter coefficients using the filter command.

Please see Example #2 in the [Tuneup #4 Assignment solution](#) which worked through a solution for a problem similar to part (b).

This is an interesting case where the input signal is infinite in duration and the output signal is finite in duration.

4. Frequency Response. 24 points.

Signal Processing First, problem P-6.1, page 157. Please comment on the differences between the input and output signals. What parameter(s) changed? By how much? What parameter(s) didn't change?

As stated on the course descriptor, "Discussion of homework questions is encouraged. Please be sure to submit your own independent homework solution."

NOTE: In your solutions, please put all work for problem 1 together, then all work for problem 2 together, etc. Please see additional homework guidelines on the homework page.