

THE UNIVERSITY OF TEXAS AT AUSTIN  
Dept. of Electrical and Computer Engineering

*EE313 Linear Systems and Signals*  
Problem Set #3: Continuous-Time Convolution

Prof. Brian L. Evans

Date assigned: September 9, 2010  
Date due: September 16, 2010

*Homework is due at 11:00 am sharp in class. Late homework will not be accepted.*

---

Reading: *Signals and Systems*, Section 3.6

---

You may use any computer program to help you solve these problems, check answers, etc.

Reading Section 3.5 might also be helpful. Section 3.5 will be required reading on homework #5.

Applets to animate convolution are available at <http://www.jhu.edu/~signals>. I have been using the Joy of Convolution applets in lecture to demonstrate convolution.

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

The office hours in ENS 433B for Prof. Evans follow:

- Tuesdays 12:15pm–1:00pm (right after lecture)
- Wednesdays 12:30pm–2:00pm
- Thursdays 12:15pm–1:00pm (right after lecture)
- Fridays 9:30am–11:00am

In addition, Prof. Evans holds a coffee hour on Fridays afternoons at a nearby café. For Friday, September 10th, his coffee hour will be 2:00pm–3:00pm. Prof. Evans can be reached at [bevans@ece.utexas.edu](mailto:bevans@ece.utexas.edu).

The teaching assistant is Mr. Jackson Massey. His office hours will be on Wednesdays 4:00pm–7:00pm in ENS 138. Mr. Massey can be reached at [jackson.massey@gmail.com](mailto:jackson.massey@gmail.com).

The ECE Department has traditionally offered tutoring sessions for all basic sequence ECE courses, including EE 313, on Sundays through Thursdays, 7:00–10:00 pm, in ENS 318. Tutoring will begin on September 20th.

Each time that the homework assignment asks for a Matlab plot, please turn in the Matlab code that you had written with your homework assignment.

**Problem 3.1** System Properties

Roberts, Chapter 3, Problem 33.

**Problem 3.2** Continuous-Time Convolution

Convolve a rectangular pulse of amplitude 1 with non-zero extent of  $t \in [0, 1]$  and a rectangular pulse of amplitude 2 with non-zero extent of  $t \in [0, 2]$ . In your solution, break the convolution down into five intervals as is done on slides 4-4 to 4-7. Plot the convolution result using Matlab.

**Problem 3.3** Daughter of Continuous-Time Convolution

Roberts, Chapter 3, Problem 54. Assume that the initial conditions are zero. Plot the convolution results for each part using Matlab.

*Note: In the course reader, Appendix F might be helpful.*

**Problem 3.4** Son of Continuous-Time Convolution

What signal when convolved with  $-2 \cos(t)$  would produce  $6 \sin(t)$ ?

Please find a second signal that when convolved with  $-2 \cos(t)$  would also produce  $6 \sin(t)$ ?

*Note: This problem is a variation on Roberts, Chapter 3, Problem 51.*