EECS 361
Homework #4

1. Section 3.2 Participation Activities
3.2.1: Measuring impulse response via a narrow pulse input.
3.2.2: Determining impulse response as the derivative of the step response.

2. (Concept: Measuring system response)
An unknown LTI system is provided. Describe a method to find the impulse response of this system.

3. (Concept: Relationship between impulse and step responses)
Find the impulse response for a system with an step response of

$y_{\text{step}}(t) = 2\ \text{tri}(\frac{t-6}{6})$

4. (Concept: Measuring impulse response)
Exercise 3.2.5

5. Section 3.3 Participation Activities
3.3.1: Methods to implement convolution.
3.3.2: Convolution of rectangular pulses.
3.3.3: Convolution of rectangular pulses, heights 3 and 4, widths 1 and 2.

6. (Concept: Linear property of the convolution integral)
Show that a system represented by a convolution integral is a linear system.

$$\int_{-\infty}^{\infty} x(\tau)\, h(t-\tau)\, d\tau$$

7. Section 3.4 Participation Activities
3.4.1: RC circuit response to rectangle pulse, graphical and analytical convolution.
3.4.3: Graphical convolution of rectangular pulse input and triangle impulse response.

8. (Concept: Continuous time convolution)
Find and plot the convolution of the following functions.

a. $x(t) = 4\ \text{rect}\left(\frac{t}{4}\right)$ and $h(t) = 8\ \text{rect}\left(\frac{t}{4}\right)$

b. $x(t) = 4\text{rect}\left(\frac{t-1}{4}\right)$ and $h(t) = 8\ \text{rect}\left(\frac{t-4}{4}\right)$

c. $x(t) = 1\ \text{rect}(t-1)$ and $h(t) = 2\ \text{rect}\left(\frac{t-2}{2}\right)$

d. $x(t) = \text{rect}(t-.5)$ and $h(t) = t\text{rect}(t-.5) + u(t-1)$

9. (Concept: Continuous time convolution of time shifted signals)
a. Let $x(t) = \text{rect}\left(\frac{t-5}{3}\right)$ and $h(t)=\text{rect}\left(\frac{t-10}{3}\right)$, find $y(t)= h(t)*x(t)$ and plot $y(t)$.
b. Repeat for $x(t) = \text{rect}\left(\frac{t-10}{3}\right) + \text{rect}\left(\frac{t+10}{3}\right)$