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

EE313 Linear Systems and Signals
Problem Set #2: Signal Plotting, System Properties and Impulse Responses

Prof. Brian L. Evans

Date assigned:	September 2, 2010
Date due:	September 9, 2010

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

Reading: *Signals and Systems*, Sections 3.1–3.4

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

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 coffee hours on Fridays 1:30–2:30pm at a nearby café. Prof. Evans can be reached at `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`.

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 637. The tutoring will begin on September 20th.

Problem 2.1 Modeling Signals

Roberts, Chapter 2, Problem 54. The mathematical description of $x(t)$ should be a formula using signals defined in Chapter 2. In addition, convert your mathematical description of $x(t)$ in MATLAB code and plot $x(t)$ in MATLAB for $t \in [-0.1ms, 0.3ms]$ to verify that your mathematical description is correct.

Note: Binary Phase Shift Keying (BPSK) is used in many communication systems, including ADSL2, WiFi and WiMax modems. The BPSK signal in this problem is an analog continuous-time signal that carries one bit of information every ms, or equivalent 1000 bits/s.

Problem 2.2 Transformations

Roberts, Chapter 2, Problem 63, parts (b) and (c).

In part (c), the argument of $g[n/2]$ can only index into g when $n/2$ is an integer. When $n/2$ is not an integer, we set the value of $g[n/2]$ to zero. The comb function might be helpful here.

Problem 2.3 System Properties

Roberts, Chapter 3, Problem 32.

Problem 2.4 Impulse Response

Roberts, Chapter 3, Problem 43.

Plot the impulse response in MATLAB for $n = [-1, 10]$.