Homework #1, EECS 206, W03. Due **Fri. Jan. 10**, by 11:30AM

Notes

- We will use the Wolverine access email service to send announcements to the class. Make sure that you have a proper email address associated with your uniquename for email to *uniquename*@umich.edu.
- You must write the Engineering Honor Pledge on your exams in this class for them to be graded. To review the honor pledge, visit `http://www.engin.umich.edu/org/ehc/`

Homework Policies

- Homework solutions must be placed in the 206 "lock box" in room 4230 EECS by the due date and time.
- Absolutely no late homework will be accepted. See the "one free pass" policy on the syllabus which is designed to cover unforeseen circumstances like illness, flat tires, homework chewing dogs, etc.
- Solutions will be posted on the web shortly after the due date and time. To access the solutions you will need the password given in lecture.
- Homework will be returned in lab sections about 1.5 weeks after the due date.
- You must **write your lab section *number*** at the top of your solution, otherwise you will be deducted 10 points and most likely your score will not be entered until you see your GSI about it.
- *Staple* your homework solution in the upper left corner, and put all problems *in the assigned order*.
- Write neatly. Annoyed graders will be understandably frugal with partial credit.
- Possibly only a subset of the problems will be graded. The final answers to some of these problems are given. These problems are perhaps less likely to be graded. Problems that are not graded may be more likely to be used on exams. Be sure to check your answers against the solutions, even if the grader gives you full credit, since often there are both easy and hard ways to solve these problems!
- Points are indicated with square brackets. A problem marked [0] points will not be graded (though solutions will be provided), but may still be the basis for exam questions unless labeled "challenge."
- Unless instructed otherwise, you may use Matlab to help solve any problem for which it is useful, even if not explicitly instructed to use Matlab by the problem. However, keep in mind that on the exams you will not have Matlab available, so if there is a "non-Matlab" approach then you will need to learn it too. Also, to ensure earning full credit (and to help get partial credit) you should convey to the grader how you solved the problem, (*e.g.*, by including the Matlab code that you used in your solution). Our recommendation would be to use Matlab to check your intuition and/or to get you started, and then try to solve the problems analytically.
- Homework regrade requests must be submitted *in writing* (not by email) to your GSI within one week of when your GSI returned that homework to your lab section (regardless of whether you attended). If you are unsatisfied with the GSI's response to your regrade request, then you may appeal *in writing* to Prof. Fessler within one week after your GSI responds to your initial regrade request.
- All homework assignments are to be completed on your own. You may consult with other students (and GSI's) during the conceptualization of a solution, but all written work, whether in scrap or final form, must be generated by you working alone. Violation of this policy will be treated as an honor code violation. In particular, students submitting identical Matlab programs will be reported to the honor council just like in any software class. If you have questions about this policy, please do not hesitate to contact the instructors.

Skill Problems

Skill problems emphasize the basic concepts and problem solving skills that are required to learn this material at a passing level.

0. [0]
   - Visit the EECS 206 web page and print the errata for the DSP First textbook.
     (There are two lists of errors. Newer printings of the text may have some of the typos already corrected.)
   - Check the 206 web page for errata for the lecture notes periodically.
   - Read Chapter 1 of text.
   - Read "Part 1" lecture notes.
   - **Write your lab section # on the top of your solutions!** (Not the time, not the GSI's name, the *number*.)

1. [10] Concept(s): ***continuous-time signals, discrete-time signals, sketching, sampling***

   (a) [0] Sketch the continuous-time signal $x(t) = \begin{cases} e^{-t/10}, & t \geq 1 \\ 0, & \text{otherwise.} \end{cases}$

   For full credit, label your axes in this plot and in *all* sketches/plots throughout the course!

   (b) [3] Sketch the discrete-time signal $x[n]$ formed by the sampling operation $x[n] = x(nT_\mathrm{s})$, where $T_\mathrm{s} = 4$.

   (c) [5] Find a mathematical expression for $x[n]$ (using braces).

   (d) [1] Determine the continuous-time signal value $x(50)$.

   (e) [1] Determine the discrete-time signal value $x[50]$. Hint: $x[50] \neq \mathrm{e}^{-5}$.

2. [10] Concept(s): ***signal characteristics: duration, min/max, energy, mean***

   Consider the following signal

   $$x(t) = \begin{cases} 1 - (t-2)^2, & 1 < t < 3 \\ 0, & \text{otherwise.} \end{cases}$$

   (a) [2] Determine the duration of $x(t)$. Hint: plot it.

   (b) [2] Determine the minimum and maximum values of $x(t)$.

   (c) [3] Determine the energy of $x(t)$.

   (d) [3] Determine the mean value $\mathrm{M}(x)$.

Mastery Problems

Mastery problems require integration of concepts across the course (particularly later in the course), or involve derivations. An ability to solve these types of problems is expected of students who wish to excel in this subject. Like real-world problems, these problems usually do not have corresponding examples that can be simply followed step by step. Instead, one must synthesize the concepts learned.

(There will be some of these on HW2, which is already posted on the web.)