ECE130B Home Work 1

One page **Due date:** January 14, 2008.

Any problem marked as a "Reading assignment" doesn't have to be turned in. Write your name and your TA's name clearly on the assignment and make sure all pages are stapled together. Answers must be written clearly and legibly. Illegible answers will be ignored. Your answers must be justified by complete and clear sentences.

1. **Reading assignment.**

   A) Read chapter one, especially the material on discrete signals and systems.

   B) Revise chapter three on the Fourier series representation of periodic signals. I will assume that you are competent with this material from ECE130A.

   C) Get familiar with a graph plotting program; Matlab or Gnuplot are good choices. Make sure that your package can deal with discrete signals.

2. Let $x[n] = 2\,u[n] + 5\,\delta[n+7] - 5\,u[n-3]$. Give explicit formulas and draw graphs of the following signals:

   A) $x[-n+5]$

   B) $x[-n-5]$

   C) $x[-7\,n+5]$

   D) $x[-7\,n-5]$

3. Let $x(t) = \sin(2\ \pi\ t)$. Plot the discrete signal obtained by sampling $x(t)$ (including a sample at $t=0$) every

   A) 1 second

   B) 2 seconds

   C) $\frac{1}{2}$ second

   D) $\frac{1}{4}$ second.

4. Determine which of the following systems are (i) linear and/or (ii) time-invariant. Justify your answers. (Note: $x[n]$ denotes the input signal and $y[n]$ denotes the output signal.)

   A) $y[n] = \cos(2\,x[n])$

   B) $y[n] = x[n-3] - 2$

   C) $y[n] = x[-n]$

   D) $y[n] = \mathfrak{Re}(x[n])$, (real part of $x[n]$)

   E) $y[x] = x[4\,n]$

   F) $y[n] = x[2\,n-1] + x[-5\,n]$

   G) $y[n] = n\,x[n-1]$