Homework Set 8 **EECS 206** **Due: Fri., Mar. 15, 2002**

Relevant lectures: 3/4, 3/6/ 3/8, 3/11

Relevant reading: Chapter 5.

Relevant items in the DSP First CD: Homework Problems: 5.18-5.29, 5.3, 5.12-5.17.

Homework submission policies: As usual.

1. 5.1 a, b, c, p. 152

2. 5.2, p. 153
   Additional parts:
   (d) Is the filter causal?
   (e) Find the order of the filter.

3. 5.6, p. 155

4. 5.7, p. 155
   In addition, for those systems that are not time-invariant, find an example of an input signal $x[n]$ and a time n_o such that the response to $x[n-n_o]$ is not the same as $y[n-n_0]$, where $y[n]$ is the response to $x[n]$. Plot $x[n-n_o]$, $y]n-n_o]$ and the response of the system to $x[n-n_o]$.

5. 5.11, p. 156

6. Suppose a filter with impulse response $h[n]$ has input signal $x[n]$ that is periodic with period n_o. Show that the output $y[n]$ is periodic with period n_o. Hint: Starting by writing down the definition of what it means for $y[n]$ to be periodic period n_o. Also write a formula for $y[n]$ in terms of $x[n]$ and $h[n]$. There are two such formulas, one of which will be easier to work with.

7. A filter has coefficients $b_0 = 2$, $b_1 = -1$, $b_2 = 1$. The input signal is the complex exponential signal
   $$x[n] = 2\, e^{j(0.3\pi n + .1)}.$$
   Find the output signal $y[n]$. Simplify the expression for $y[n]$ as much as possible. Hint: Can you express $y[n]$ as a complex exponential signal in standard form? Do not use the methods of Chapter 6. Use only the methods of Chapter 5.