<u>EE322 Fall 2012 Homework Problem Set 28 (PS28)</u>

Be sure to show your work.

1. Text, Problem 12-5a, b, c, d. Hint: find the impulse responses to determine if causal. Also, recall that $\omega = 2\pi f$.

2. Find the absolute bandwidth, the null bandwidth, and the half-power (-3dB) bandwidth for each of the following. **<u>Hint</u>**: bandwidths are computed based on *frequency response*. **<u>Another hint</u>**: some of these can be answered by plotting the frequency response in MATLAB, and zooming in on the plot. **<u>Even another hint</u>**: PS06 had you write the code for the tri function.

   a. A filter that has an <u>impulse response</u> given by: $h(t) = 100 \cdot \text{sinc}(100t)$.

   b. A filter that has a <u>frequency response</u> given by: $H(f) = \frac{1}{2} \cdot \text{tri}\left(\frac{f-2500}{400}\right) + \frac{1}{2} \cdot \text{tri}\left(\frac{f+2500}{400}\right)$.

      Hint: a MATLAB plot can be used to help you find the answer.

   c. A filter that has an <u>impulse response</u> given by: $h(t) = 100 \cdot \text{rect}(100t)$.

      Hint: a MATLAB plot can be used to help you find the answer.

3. An ideal low pass filter has a frequency response given by $H(f) = 2 \cdot \text{rect}\left(\frac{f}{1500}\right) e^{-j2\pi f/500}$. The input to the filter is $x(t) = 2\cos(2\pi 225t + 0.25\pi) - 3\cos(2\pi 760t - 0.35\pi)$. Write the equation for the signal that comes out of the filter.