1. Design a Chebyshev digital filter with a sampling rate of $f_s=10000$, and 3dB roll off at 1kHz and at least 40dB down at 3kHz. Show your work. Express your answer in the form of a difference equation and list your values for the a_k's and the b_k's.

2. Check your work using MATLAB's `cheby1()` command.

3. Verify your design by using MATLAB's `freqz()` command to plot the frequency response of your filter. Use the `axis()` command to zoom in on the 0 to 4 kHz frequency range and the -20 to 0 dB amplitude range.

4. Design a Butterworth digital filter with a sampling rate of $f_s=10000$, and 3dB roll off at 1kHz and at least 35dB down at 3kHz. Show your work. Express your answer in the form of a difference equation and list your values for the a_k's and the b_k's.

5. Check your work using MATLAB's `butter()` command.

6. Verify your design by using MATLAB's `freqz()` command to plot the frequency response of your filter. Use the `axis()` command to zoom in on the 0 to 4 kHz frequency range and the -20 to 0 dB amplitude range.

7. Prove that a system with one real pole at A is unstable if A>1. Hint: find the impulse response.