

## Physics 262

### Homework #4

Show your work.

For design problems, work to within 5% of specifications.

1. Design an active high pass filter that minimizes the distortion of waveforms with frequency greater than 1 kHz, but suppresses frequencies below 100 Hz by at least 30dB. What is the theoretical gain of this filter in the high frequency limit? What might prevent a real filter from behaving according to the theory at very high frequencies?
2. Design a bandpass filter using two 2nd order Butterworth filters, with a passband from 10-20 kHz.
3. In the previous problem, suppose the frequencies of the high pass and low pass are switched. Would this produce a band stop (notch) filter? Explain qualitatively what the resulting response would be like.
4. Extra credit: Come up with a way to combine a high pass filter with a low pass filter to form a band stop filter. I did it with two additional resistors and an op amp, but there is usually more than one way to get the job done. A correct answer will increase your score on this assignment by a “gain” of 1.2.