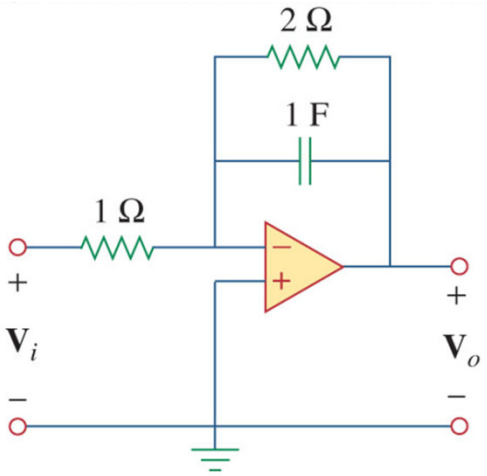
IUPUI ECE 202 Spring 2015:

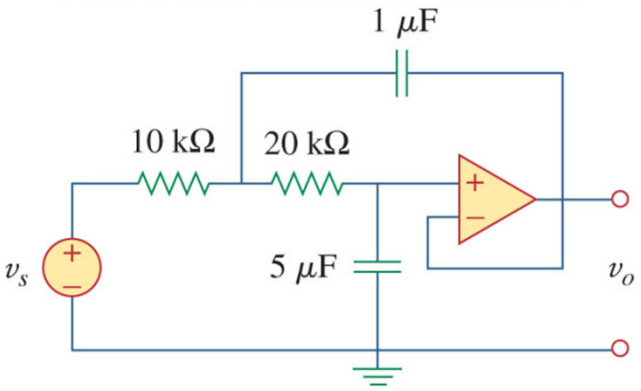
Homework #6 (Due in class: March 2, 2015) Name:

1. (**10 pts:** Prob. 14.82 in text) Scale the **lowpass** active filter shown below so that its corner frequency increases from 1 rad/s to 200 rad/s. (Use a 1 μF capacitor).

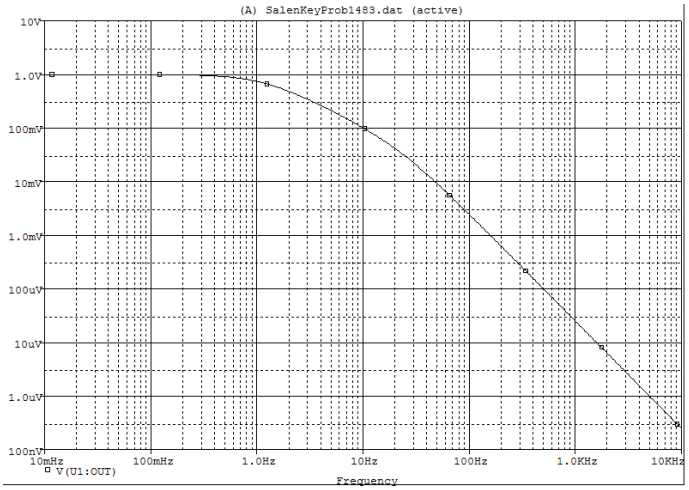


2. (**10 pts**: Prob. 14.83 from Text) The op amp circuit in the figure below is to be magnitude-scaled by 100 and frequency-scaled by 105. Find the resulting element values. (If Possible, use Pspice to verify)

   Note: This is actually a fairly significant circuit, it's called a Sallen-Key filter and is a commonly used active filter design.



From PSpice



From website:
http://sim.okawa-denshi.jp/en/OPstool.php

Sallen-Key Low-pass Filter

Transfer Function

$$G(s)=\frac{1000}{s^2+150s+1000}$$

Cut-off frequency
fc = 5.03292121045[Hz]

Quality factor
Q = 0.210818510678

3. (**20 pts:** Design Problem) Design a circuit to control the Base, Midrange, and Treble. Use 300 Hz as the crossover between the Base and Midrange and 3 KHz as the crossover between Midrange and Treble. Select resistor values to set the Base to +6 dB, the Midrange to -3 dB, and the Treble to +0dB Gain.

   Note: Refer to Figure 14.47 and note that the different bands can be summed together using a summing amplifier. This can also be used to set the Gain for each band. Ideally keep the input resistors to the filter banks at 16 ohms if possible.