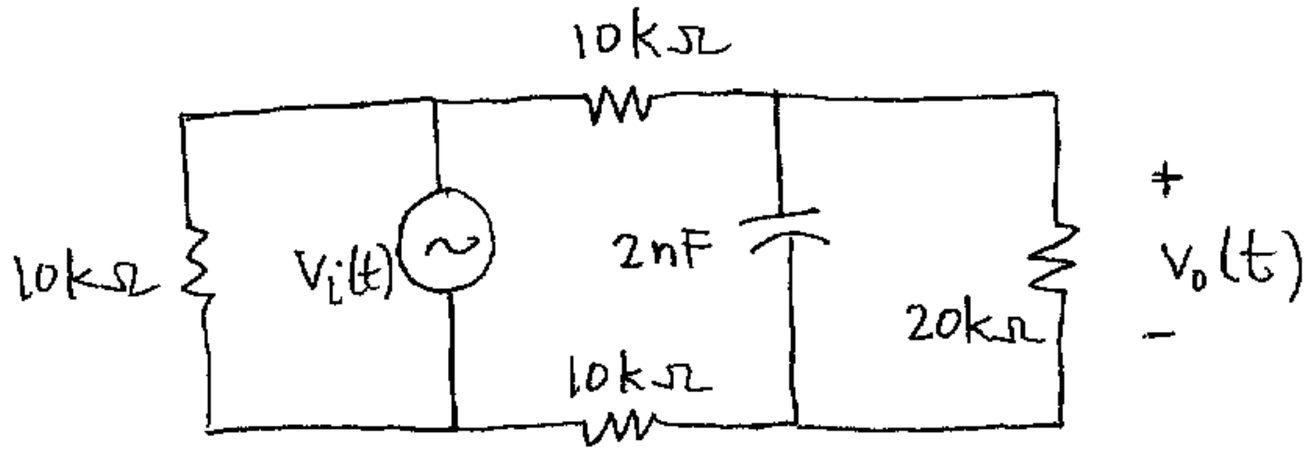
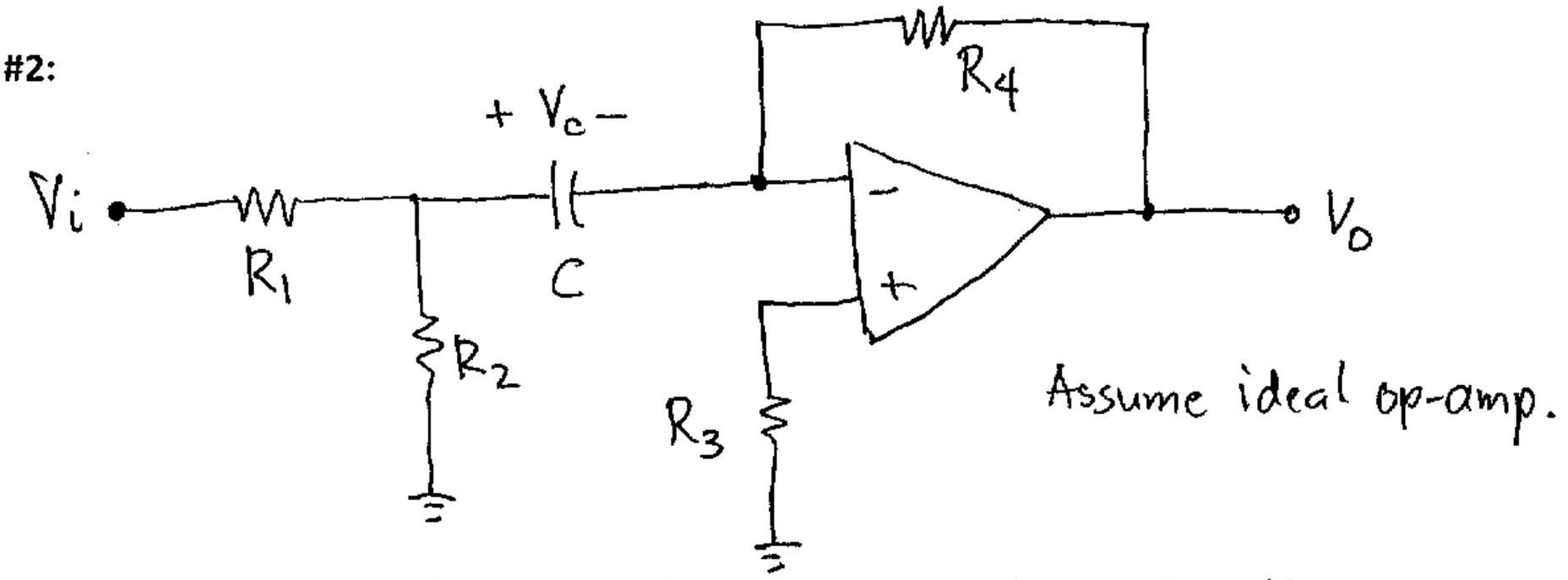
EEE 33 HW #7
Due: Friday, September 23, 2011 5:00 PM

Problem #1:



1. Find $G(j\omega) = V_o(j\omega)/ V_i(j\omega)$.
2. *What is the highest possible gain* $|G(j\omega)|$? At what frequency does this occur?
3. *What is the lowest possible gain* $|G(j\omega)|$? At what frequency does this occur?
4. What type of filter is this? Find the cut-off frequency (f_c, in Hz) and the gain at this cut-off frequency $|G(j\omega_c)|$.
5. Draw the magnitude $|G(j\omega_c)|$ vs frequency ω plot for this circuit.
6. Find the output phasor output $V_o(j\omega)$ *and the time-domain output* $V_o(t)$ *if*
   $V_i(t) = 100 + 100\cos(1x10^3t) + 100\cos(10x10^3t) + 100\cos(100x10^3t) + 100\cos(1x10^6t)$ *Volts*

Problem #2:



1. Draw the equivalent circuit of the network above when ω approaches zero. From this equivalent circuit, determine V_o.
2. Draw the equivalent circuit of the network above when ω approaches infinity. From this equivalent circuit, determine V_o.
3. Express $V_c(j\omega)$ as a function of $V_i(j\omega)$.
4. Express $V_o(j\omega)$ as a function of $V_c(j\omega)$.
5. Find $G(j\omega) = V_o(j\omega)/ V_i(j\omega)$.
6. *What is the highest possible gain* $|G(j\omega)|$? At what frequency does this occur?
7. *What is the lowest possible gain* $|G(j\omega)|$? At what frequency does this occur?
8. What type of filter is this? Find the cut-off frequency (f_c, in Hz) and the gain at this cut-off frequency $|G(j\omega_c)|$?
9. If $R_1 = R_2 = R_3 = 10k\Omega$, find the value of R_4 and C such that the maximum possible gain at the passband is 10, and the cut-off frequency is $f_c = 500$ Hz.
10. Given the values in #9 above, what is the value of the gain at the cut-off frequency?