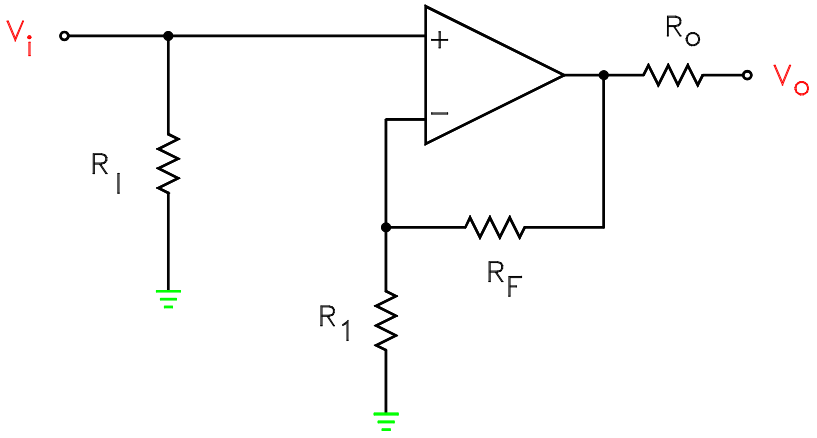
# ECE 3042
# Homework Assignment No. 2

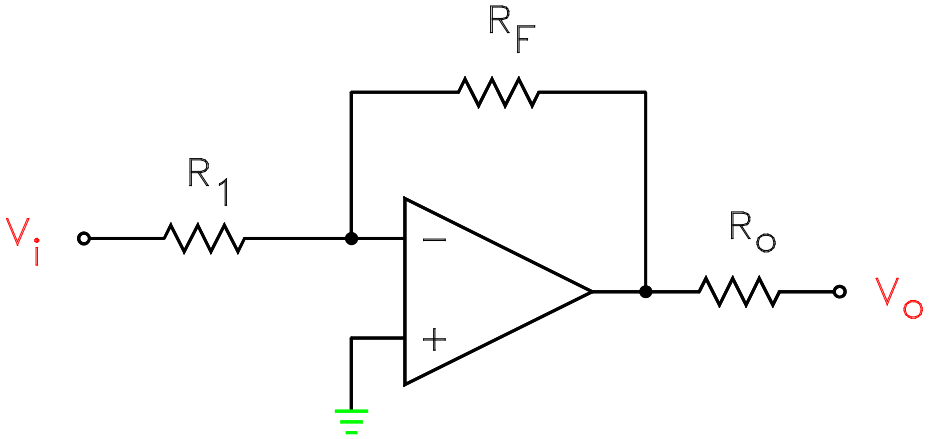
## Fall 2009 Homework for Experiment No. 2

**Due Week of September 7**

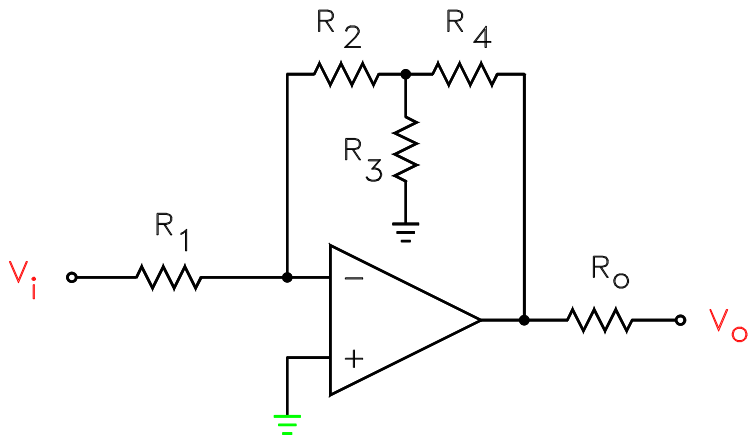
1. Design the non-inverting amplifier shown below to have a gain, $A_v = \left|\bar{V}_o/\bar{V}_i\right| = 32.2$,an input impedance of $330\,\mathrm{k}\Omega$ and an output impedance of $100\,\Omega$. For the design calculations assume that the op amp is ideal. Pick the sum of $R_1$ and $R_F$ to equal $35\,\mathrm{k}\Omega$.




2. Design the inverting amplifier shown below to have a gain, $A_v = \left|\bar{V}_o/\bar{V}_i\right| = 32.2$, an input impedance of $6.8\,\mathrm{k}\Omega$, and an output impedance of $100\,\Omega$. For the design calculations assume that the op amp is ideal.



3. Design the inverting amplifier with T Feedback Network shown below to have a gain, $A_v = \left|\bar{V}_o/\bar{V}_i\right| = 64$, an input impedance of $3\,\mathrm{k}\Omega$, and an output impedance of $100\,\Omega$. For the design calculations assume that the op-amp is ideal. Pick $R_3 = 3\,\mathrm{k}\Omega$ and $R_4 = 13\,\mathrm{k}\Omega$.




Perform an AC analysis of each of the circuits designed with National Instruments SPICE if the op- amp is an LM741 and a TL071. For the National Instruments SPICE use the virtual three terminal model for the op-amp; set the unity gain frequency to $1\,\mathrm{MHz}$ for the 741 and to $3\,\mathrm{MHz}$ for the TL071. Use the frequency range $1\,\mathrm{Hz}$ to $10\,\mathrm{MHz}$ with $100$ points per decade. Plot both axes on a log scale. Use the cursors to determine the low frequency voltage gain and the pole frequency. Compare the simulation results to the theoretical expectations. Plot the response of both circuits on the same sheet of graph paper so that the performance can be compared. For the theoretical value use the result that would be predicted by the dominant pole model of the op-amp. Omit the output resistor, $R_o$, in the simulations.