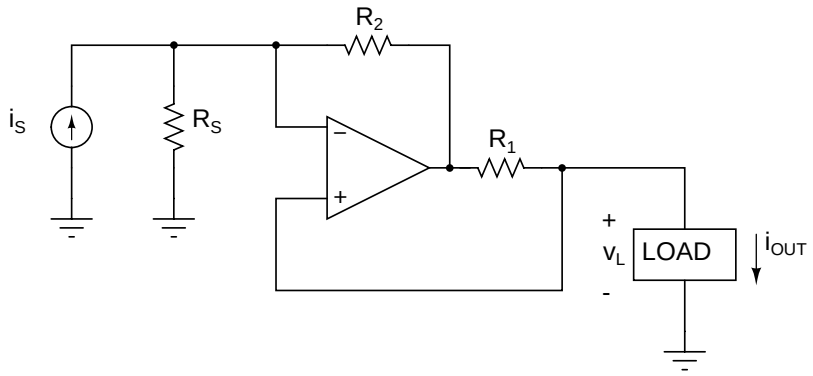
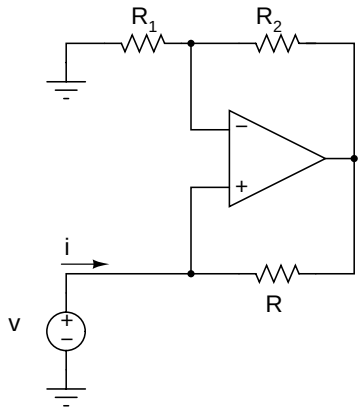
INEL 5207 - Practice Problem Set 2 - Exam 1

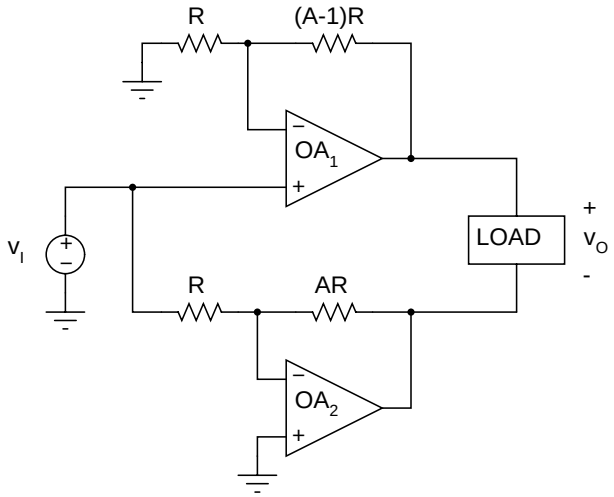
1. Show that $i_{OUT} = Ai_S - \frac{1}{R_O}v_L$, where $A = -\frac{R_2}{R_1}$and $R_O = -\frac{R_1}{R_2}R_S$, for the following circuit.



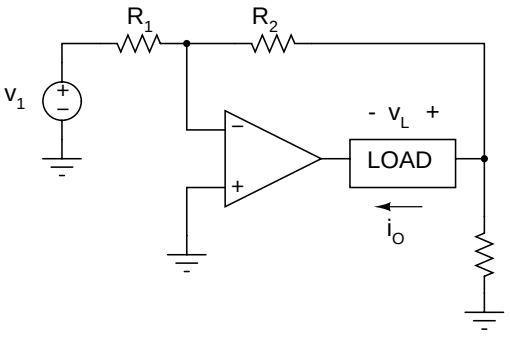
2. Show that $R_{EQ} = \frac{v}{i} = -\frac{R_1}{R_2}R$ for the following circuit.



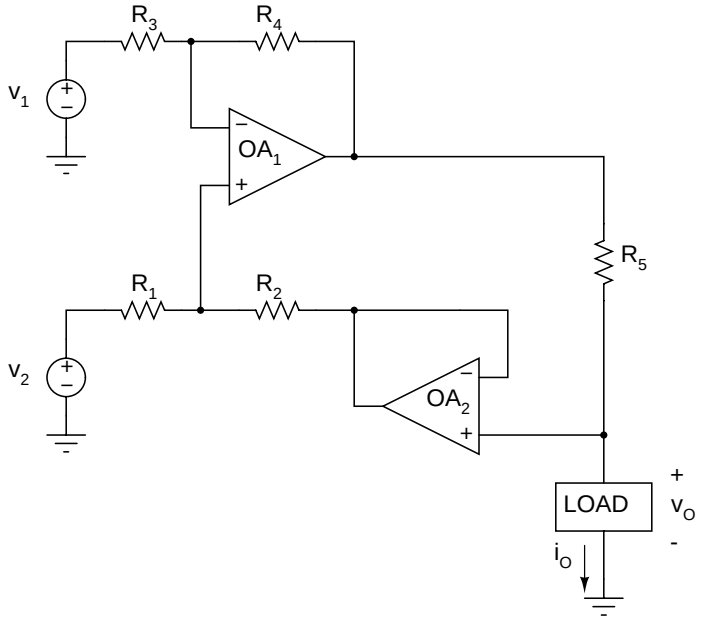
3. The circuit in the figure below, a *bridge amplifier*, allows one to double the linear output range as compared with a single op amp. (a) Show that if the resistances are in the ratios shown, then $v_O/v_I = 2A$. (b) If the individual op amps saturate at $\pm 13V$, what is the maximum peak-to-peak output voltage that the circuit can provide without distortion?



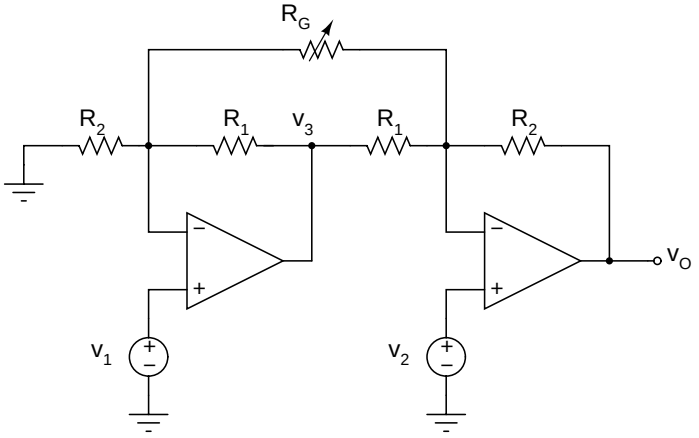
4. (a) Show that the floating-load V-I converter shown below yields $i_O = v_I/(R_1/k)$, $k = 1 + R_2/R_3$, (b) Specify standard 5% resistances for a sensitivity (gain) of 1mA/V and $R_i = 1M\Omega$, where R_i is the resistance seen by the input source.



5. (a) For the circuit shown below, given that $i_O = av_I - (1/R_O)v_L$, $v_I = v_2 - v_1$, find expressions for A and R_O, as well as the condition among resistances that yields $R_O = \infty$.



6. The following sketch shows a variable-gain, dual-op amp instrumentation amplifier. Show that $A = \frac{v_O}{v_2 - v_1} = 1 + \frac{R_2}{R_1} + \frac{2R_2}{R_G}$.



7. A single op amp transducer bridge amplifier is shown below. Show that

$$v_O = \frac{R_2}{R} \times \frac{\delta}{R_1/R + (1 + R_1/R_2)(1 + \delta)} \times V_{REF}$$