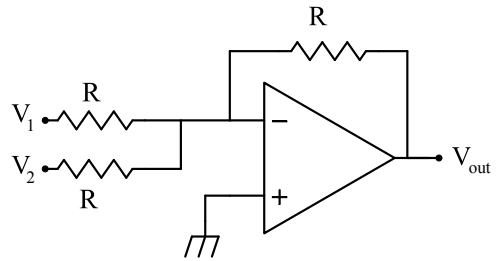
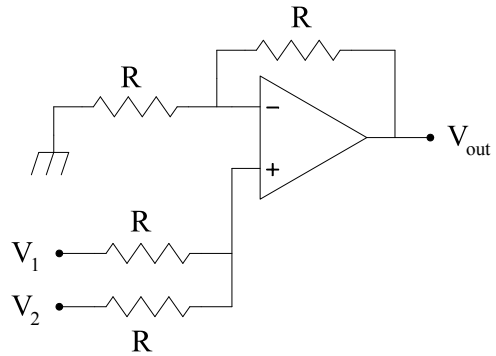


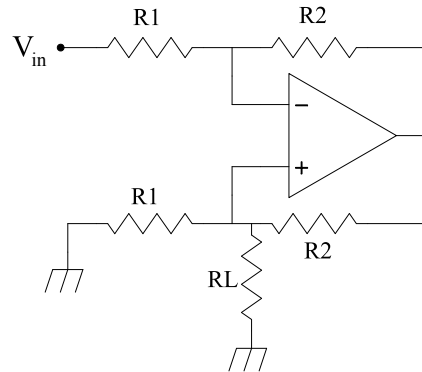
1. Using the op amp golden rules, show that the summing amplifier shown gives  $V_{\text{out}} = -(V_1 + V_2)$ .



2. For the circuit shown, use the op amp golden rules to determine the output voltage in terms of  $V_1$ ,  $V_2$  and  $R$ .



3. For the circuit shown, use the op amp golden rules to determine the current through the load resistor  $R_L$  as a function of  $V_{\text{in}}$  and the various resistances. (You might worry here whether the circuit is stable, since it has both negative and positive feedback. In fact the negative feedback will dominate as long as  $R_L < \infty$ .)



4. Assuming a *finite* op amp gain  $G$ , solve for the output voltage of the non-inverting amplifier shown. This means you can't use the golden rule  $V_+ = V_-$ , but you should use  $V_{\text{out}} = G(V_+ - V_-)$  instead.

