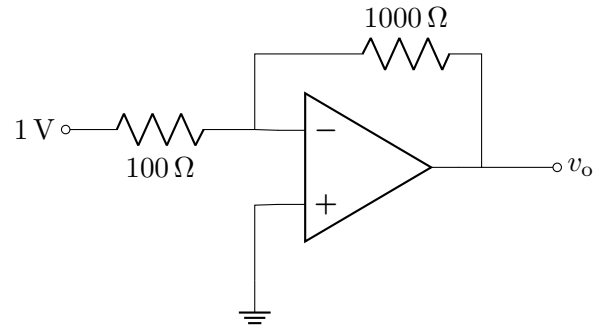
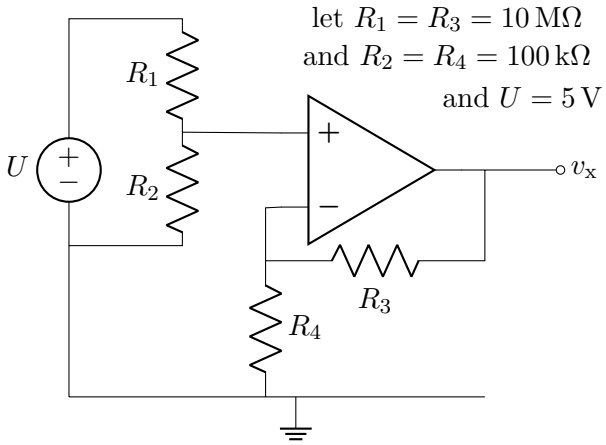
Tutorial Questions: Opamps

0. Warm-up: find v_o and v_x.





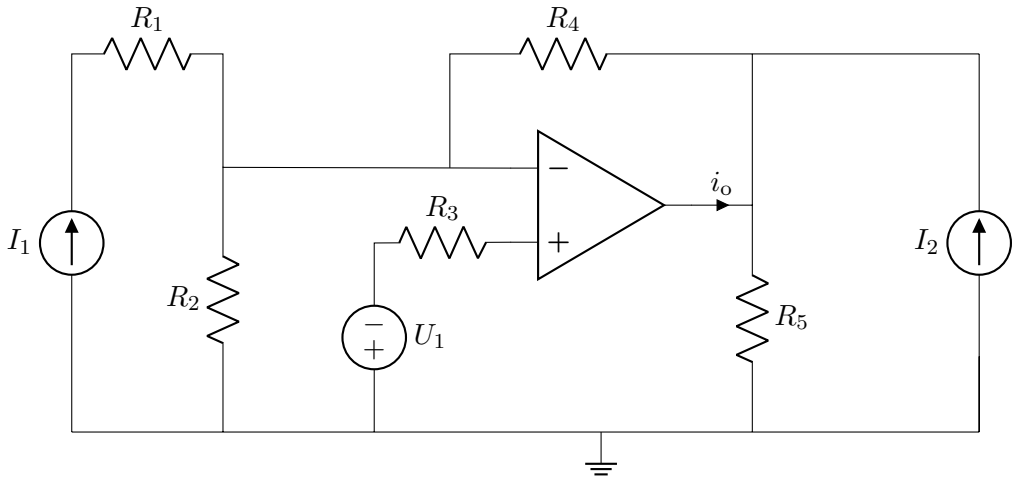
1. Find:

a) The power delivered by U_1.

b) The power absorbed (consumed) by R_1.

c) The power absorbed by R_5.

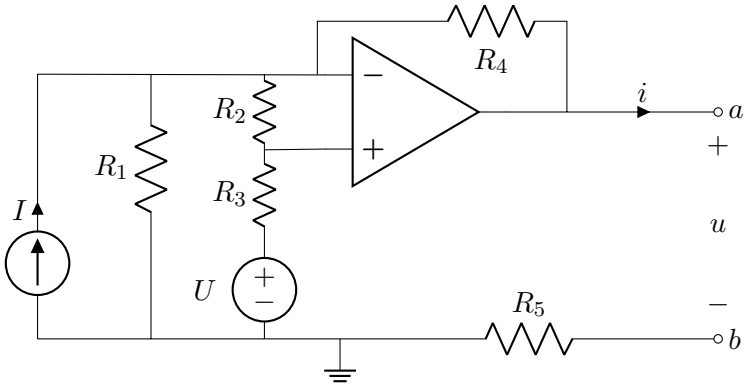
d) The marked current i_o.



2.

a) What is the voltage u in open-circuit condition ($i = 0$)?

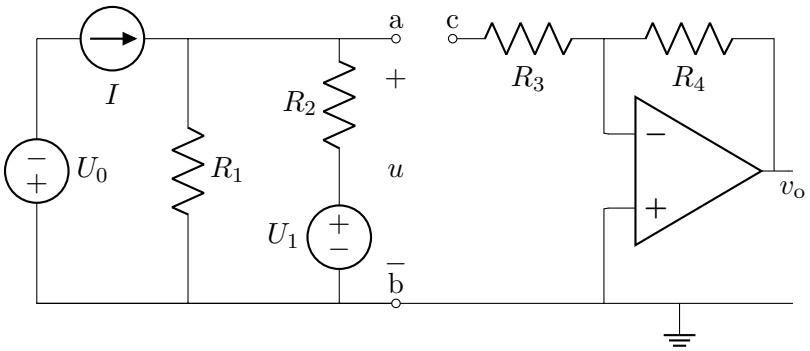
b) Find the Thevenin equivalent of this circuit, seen at terminals a-b.



3.

a) Determine the Thevenin equivalent between poles 'a' and 'b', i.e. where the voltage u is marked. (Assume the circuit is as shown, with open-circuit between 'a'-'c'. So R_3, R_4 and the opamp can be ignored for this solution.)

b) The terminals 'a' and 'c' are now joined (short-circuit). What is the potential v_o?



4.

Use nodal analysis to write equations from which the marked node-potentials v_1, v_2, v_3, v_4, v_5 can be solved. You are *not expected* to solve or simplify the equations!

This is the classic nodal-equations type of question that we studied in topic 3, but now there is an opamp to include in the equations.

Remember the two main rules:
zero current at inputs,
equal potential at inputs.
(And *don't* assume zero output current – the output is like a "voltage source from earth".)