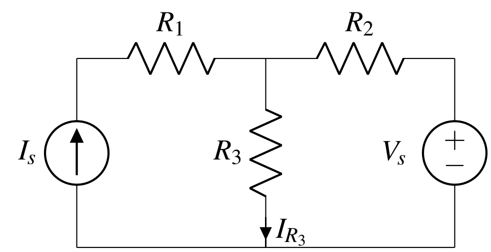
EECS 16A Designing Information Devices and Systems I
Spring 2022 Discussion 11A

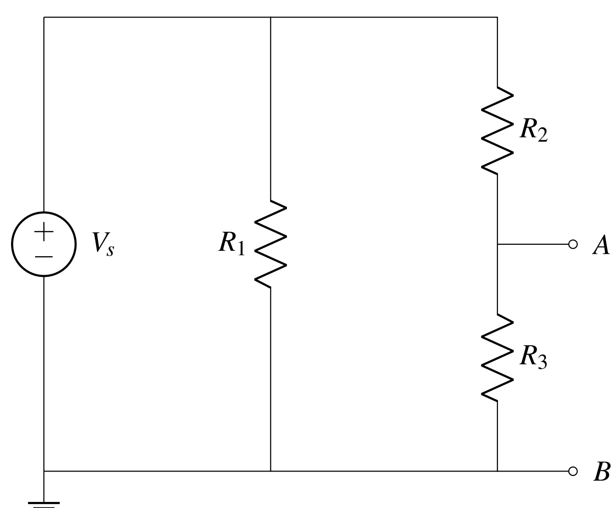
1. **Superposition**
Consider the following circuit:



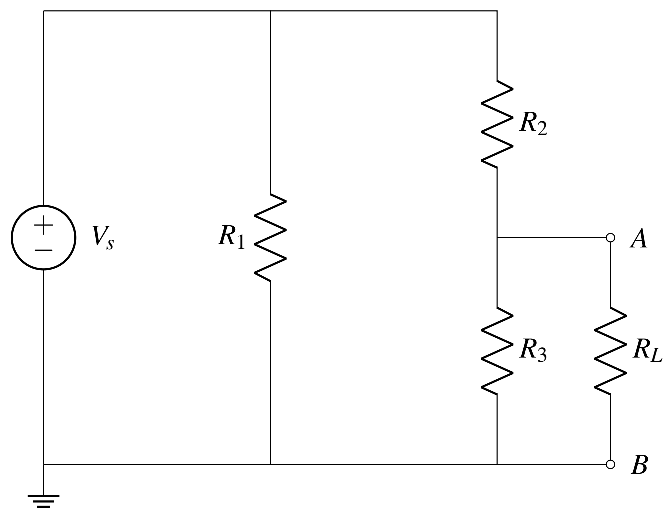
(a) With the current source turned on and the voltage source turned off, find the current I_{R_3}.
(b) With the voltage source turned on and the current source turned off, find the voltage drop across R_3, V_{R_3}.
(c) Find the power dissipated by R_3.

2. **Thévenin/Norton Equivalence**

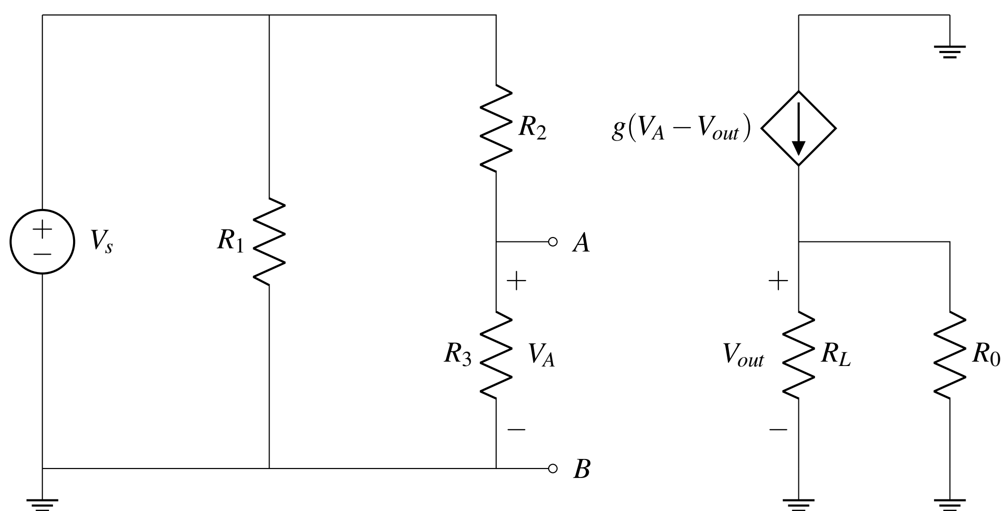
(a) Find the Thévenin resistance R_{th} of the circuit shown below, with respect to its terminals A and B.



(b) Now, a load resistor, $R_L = R$, is connected across terminals A and B as shown in the circuit below. Find the power dissipated in the load resistor in terms of given variables.



(c) We modify the circuit as shown below, where g is a known constant:

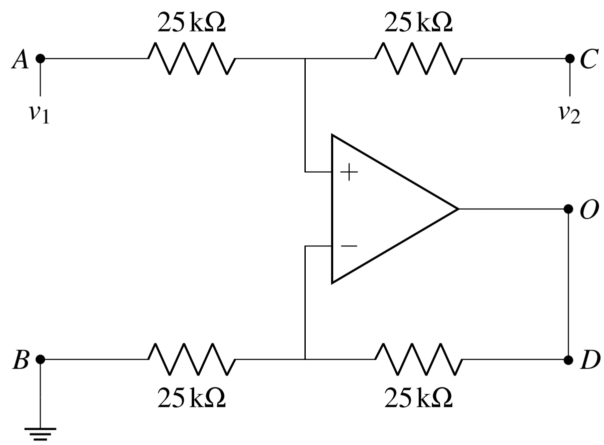


Find a symbolic expression for V_{out} as a function of V_s.
Hint: Redraw the left part of the circuit using its Thévenin equivalent.

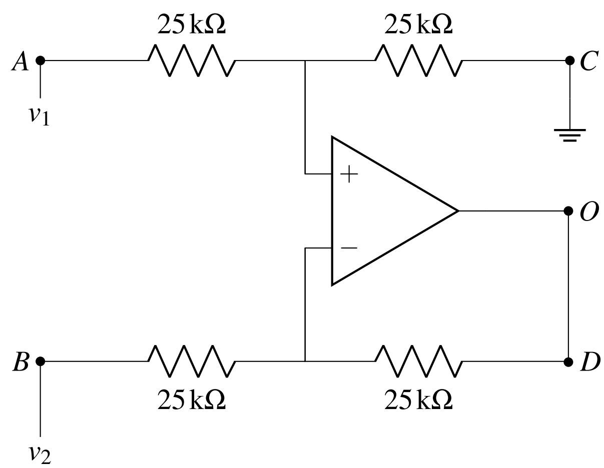
3. A Versatile Opamp Circuit

For each subpart, determine the voltage at O.

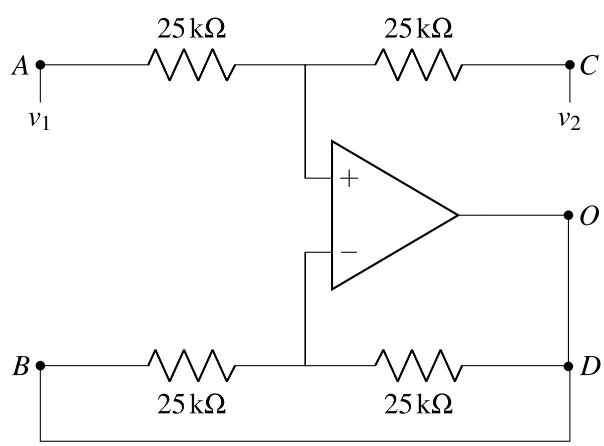
(a) Configuration 1:



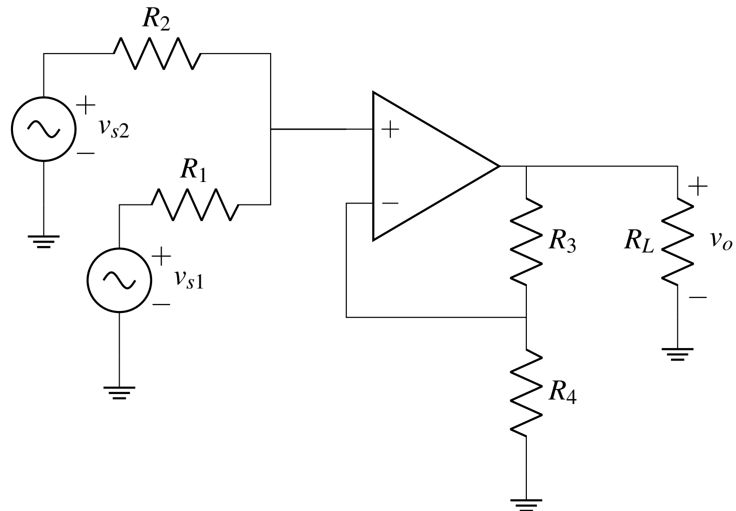
(b) Configuration 2:



(c) Configuration 3:



4. Multiple Inputs To One Op-Amp

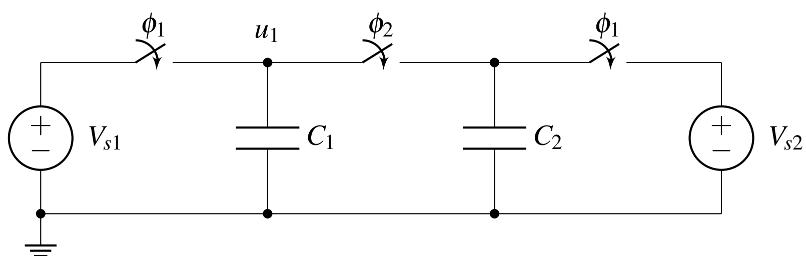


(a) For the circuit above, find an expression for v_o. *(Hint: Use superposition.)*

(b) How could you use this circuit to find the sum of different signals, i.e. $V_{s1} + V_{s2}$? What about taking the sum and multiplying by 2, i.e. $2(V_{s1} + V_{s2})$?

5. Capacitive Charge Sharing (from Spring 2020 Midterm 2)

Consider the circuit below with $C_1 = C_2 = 1\,\mu\text{F}$ and three switches ϕ_1, ϕ_2. Suppose that initially the switches ϕ_1 are closed and ϕ_2 is open such that C_1 and C_2 are charged through the corresponding voltage sources $V_{s1} = 1\,\text{V}$ and $V_{s2} = 2\,\text{V}$.



(a) How much charge is on C_1 and C_2?

(b) Now suppose that some time later, switch ϕ_1 opens and switch ϕ_2 closes. What is the value of voltage u_1 at steady state?