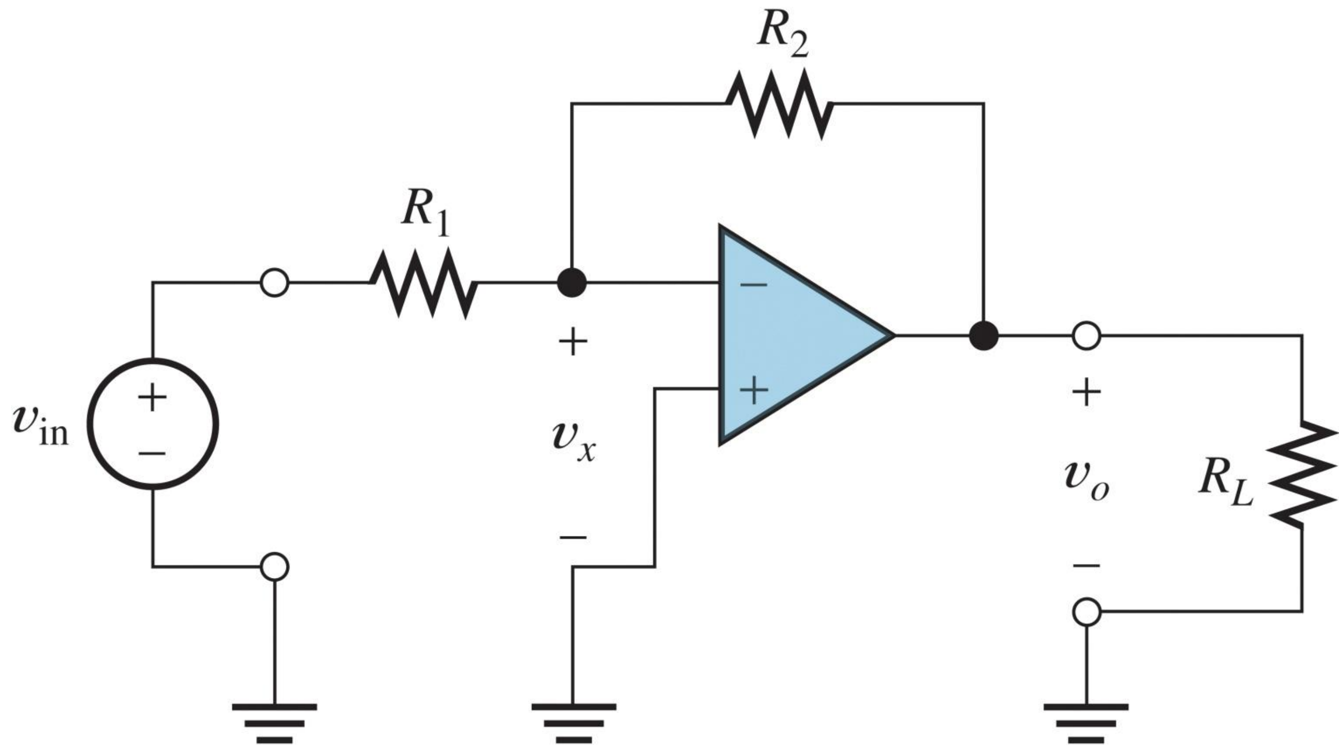
EELE 250: Circuits, Devices, and Motors

Op Amps (cont.)

Assignment Reminder

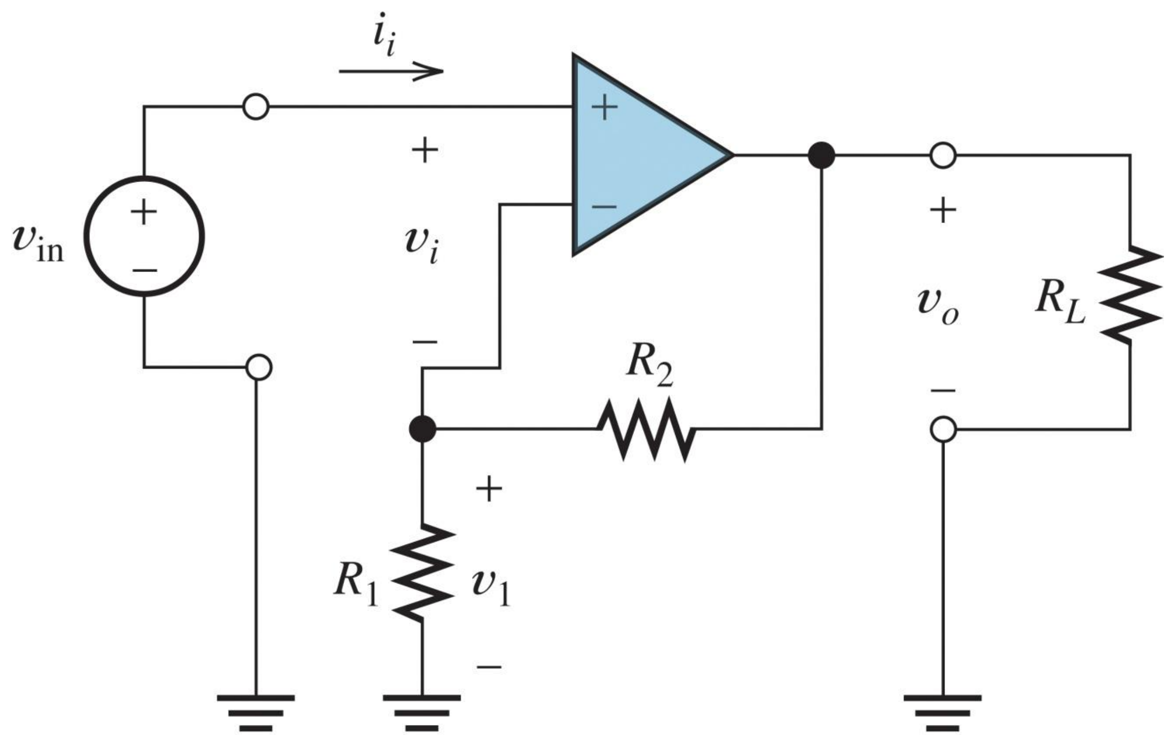
- Read 14.7 and 14.9; also read 5.7 (3 phase)
- Practice Problems:
  - P14.74, P14.75
- Lab #7 this week. A formal lab report for Lab #7 is due at your lab time Nov. 14-18.
- Exam #3: Wednesday, November 9, in class. The coverage will be amplifier concepts and operational amplifier circuit analysis.

Clicker quiz



(a) $V_o = -R_L V_{in}$
(b) $V_o = -V_{in}$
(c) $V_o = -(R_2/R_1) V_{in}$
(d) $V_o = -(R_1/R_2) V_{in}$
(e) $V_o = (1+R_2/R_1) V_{in}$

Clicker quiz



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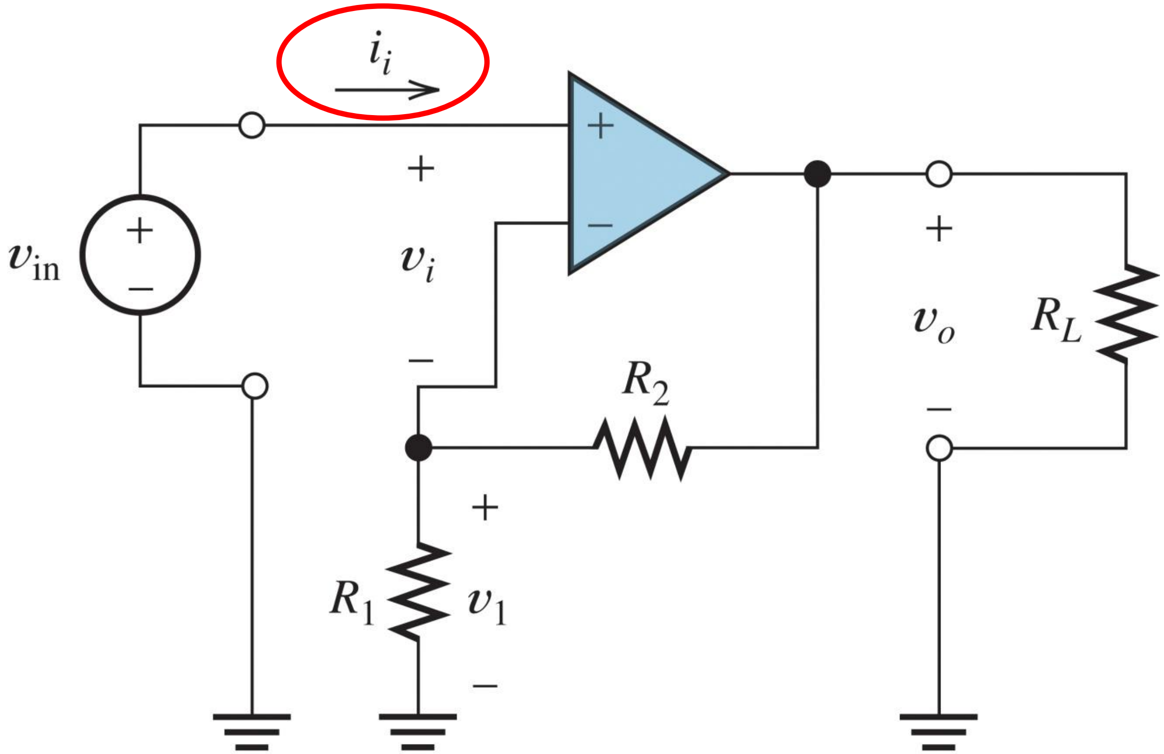
Clicker quiz



Assuming the ideal op amp model, what is i_i?

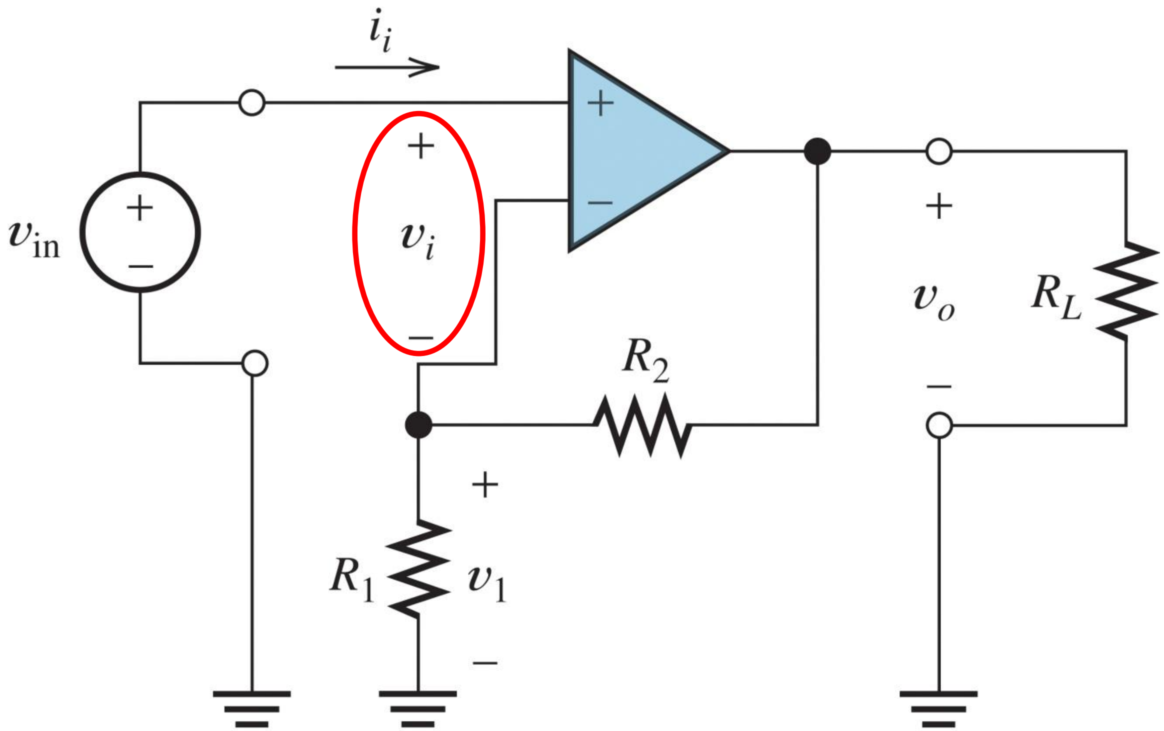
(a) $I_i = V_o/R_L$

(b) $I_i = V_1/R_1$

(c) $I_i = V_{in}/R_1$

(d) $I_i = 0$

Clicker quiz



Assuming the ideal op amp model, what is v_i?

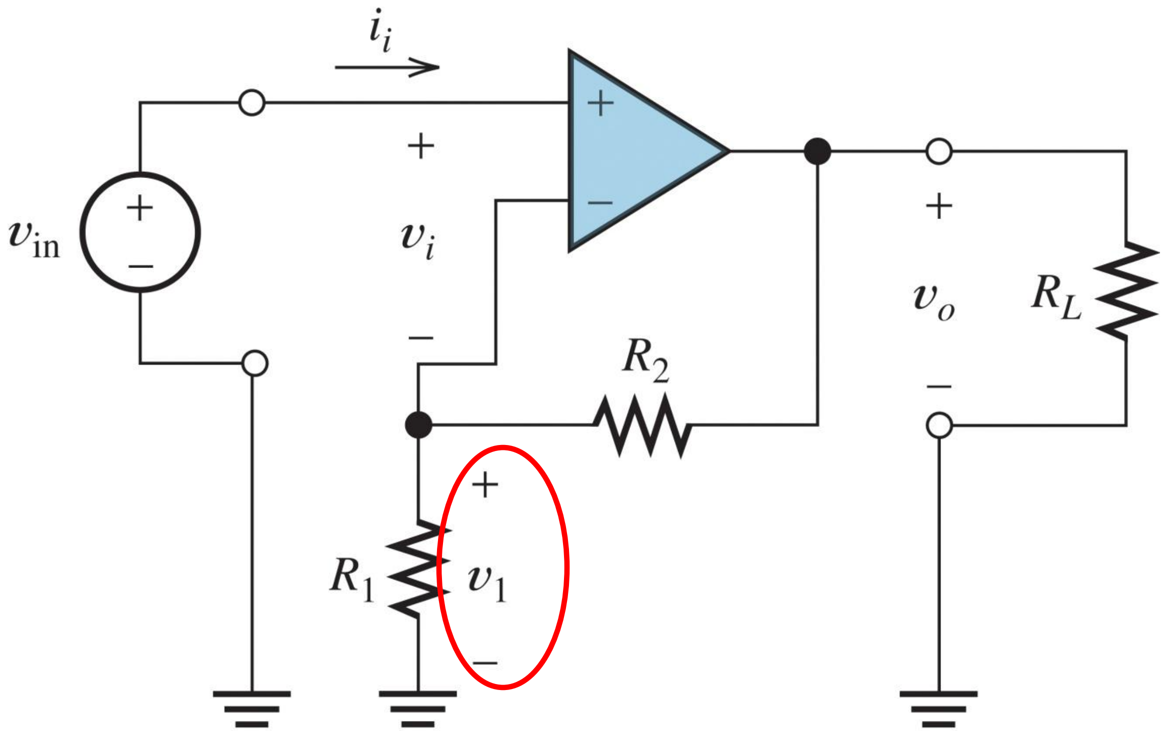
(a) $v_i = 0$

(b) $v_i = v_{in}$

(c) $v_i = -v_{in}$

(d) $v_i = v_o$

Clicker quiz



Assuming the ideal op amp model, what is v_1?

(a) $v_1 = v_{in}(R_1/(R_1+R_2)$

(b) $v_1 = v_{in}$

(c) $v_1 = -v_{in}$

(d) $v_1 = v_o$

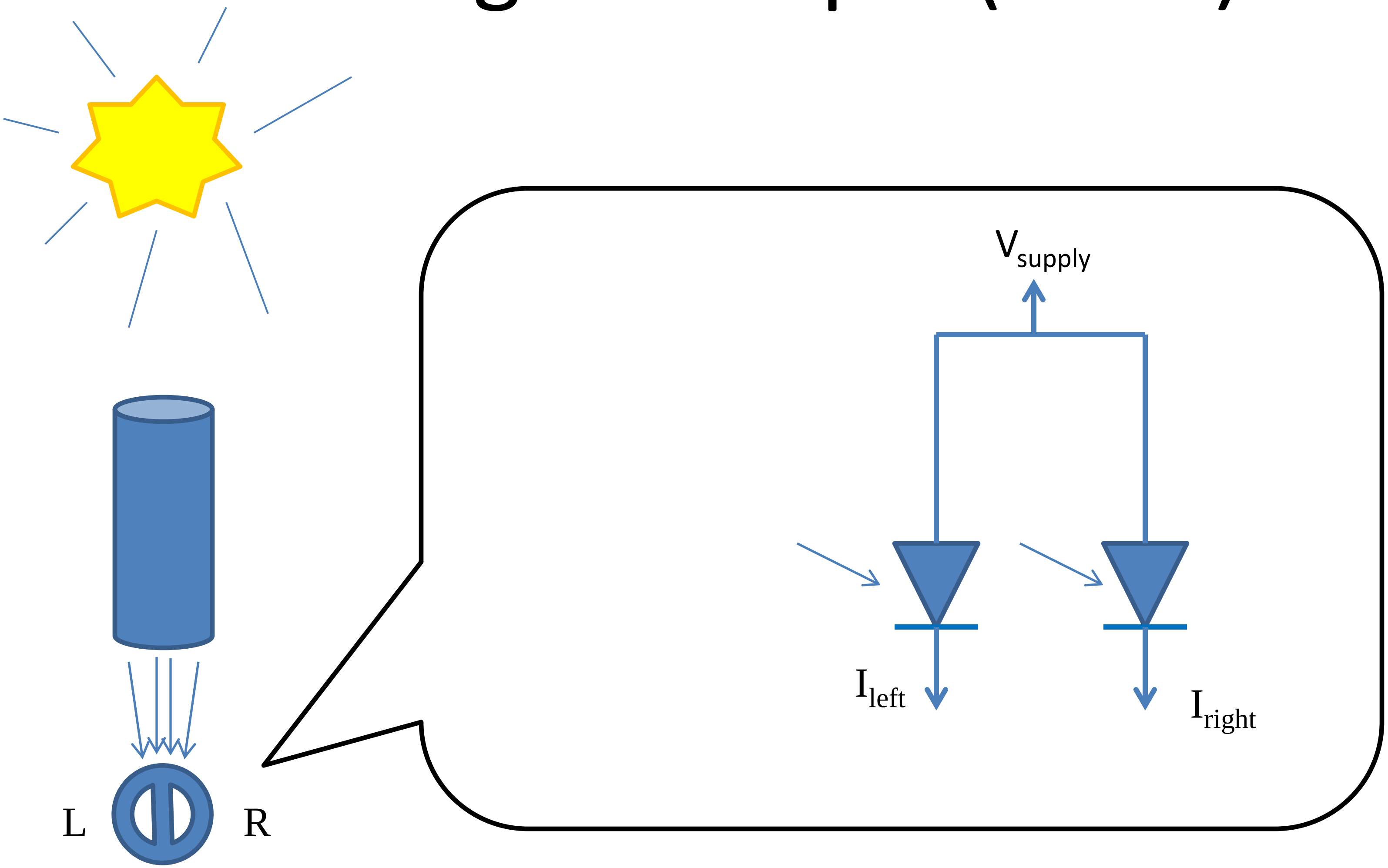
Design with Op Amps

- Typical op amp circuit design involves selecting external resistors to achieve a particular voltage gain, current gain, etc.
- Design involves selecting the best solution from several possible choices. This usually entails tradeoffs and compromises.
- Often choose basic circuits as building blocks:
  - Inverting and non-inverting configuration
  - Voltage follower
  - Summer

Design Example

- We would like to create a control voltage to steer a solar array to point at the sun.
- Two optical sensors: sensors produce a current proportional to how strongly they are illuminated.
  - If the left sensor is illuminated more than the right, we need a proportional POSITIVE voltage.
  - If the right sensor is illuminated more than the left, we need a proportional NEGATIVE voltage.

Design Example (cont.)



Design Example (cont.)

- Interpretation: We want a circuit that will create a voltage proportional to ($I_{left} - I_{right}$)
- One idea: convert the currents into voltages, subtract them, and then amplify the result
- Current to voltage converter?
- Summer?