Georgia Institute of Technology

Introduction to Electronics

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An introduction to linear electric components and a study of circuits containing such devices.

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Basic Op Amp Amplifier Configurations

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Introduce Inverting and Non-Inverting Amplifiers, Difference and Summing Amplifiers

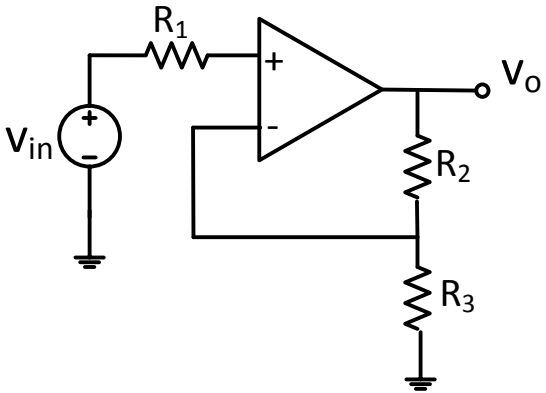
Previous Lessons

- Op Amp Ideal Behavior and Buffer Circuits

Lesson Objectives

- Introduce
  - Inverting and Non-Inverting Configurations
  - Difference and Summing Configurations
- Introduce the Gain of a circuit

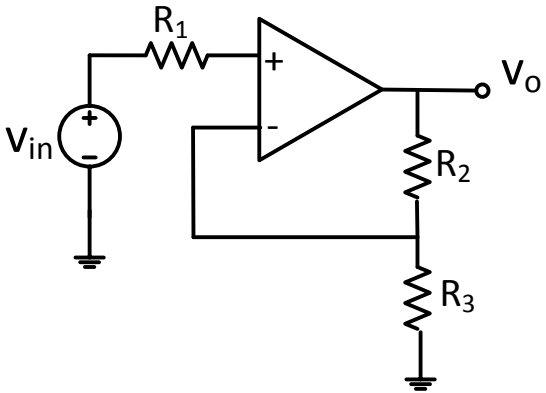
Non-Inverting Amplifiers



$$V_o = \frac{R_2 + R_3}{R_3} V_{in}$$

$$V_o = GV_{in} \qquad \text{Gain}: G = \frac{R_2 + R_3}{R_3}$$

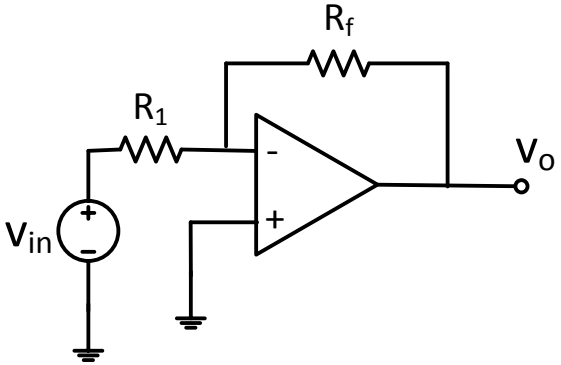
Non-Inverting Amplifier Example



If $R_2 = R_3 = 200\Omega$,

- Since,G > 1, the input is amplified
- If G < 1, the input is attenuated

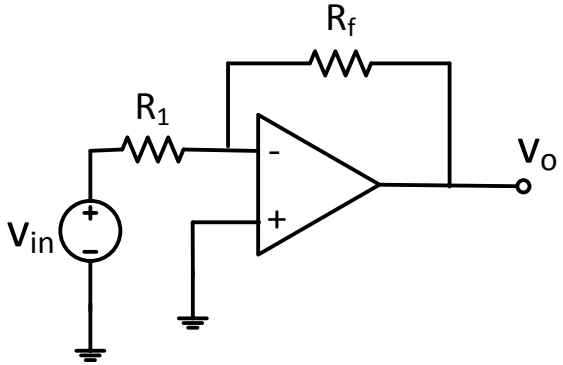
Inverting Amplifier



$$V_o = -\frac{R_f}{R_1} V_{in}$$

$$V_o = GV_{in}$$

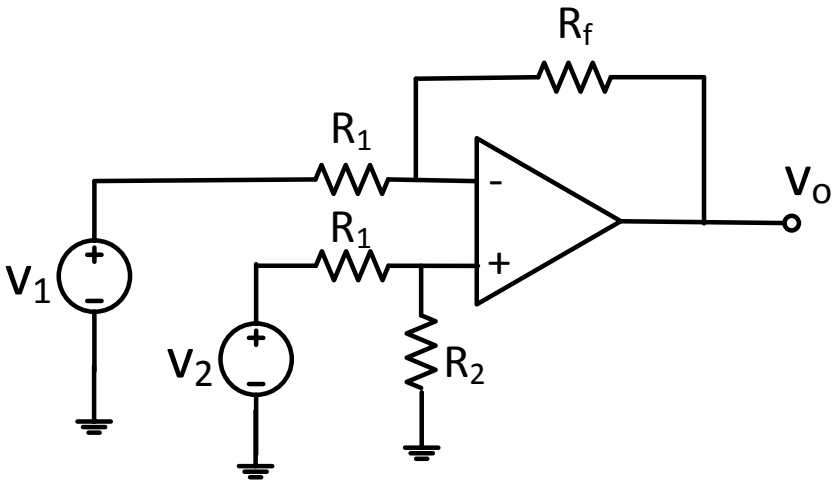
Inverting Amplifier Example



$R_1 = 1000\Omega$, $R_f = 2000\Omega$

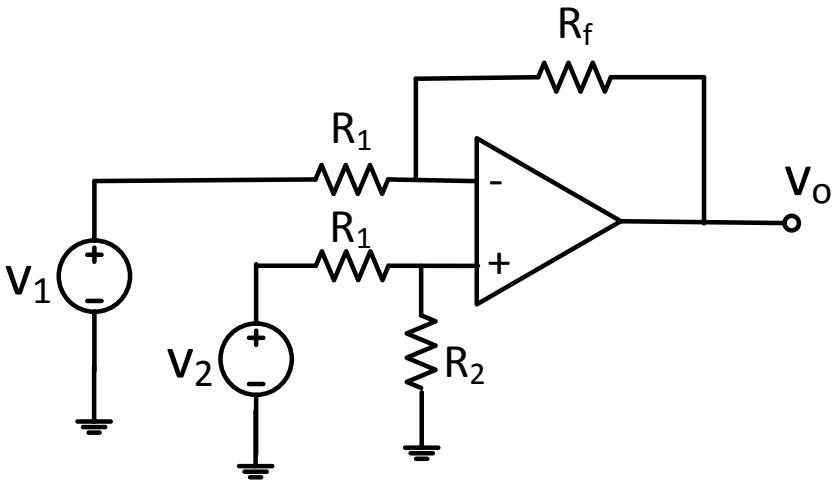
- If,G > 1, the input is amplified
- If G < 1, the input is attenuated

Difference Circuit



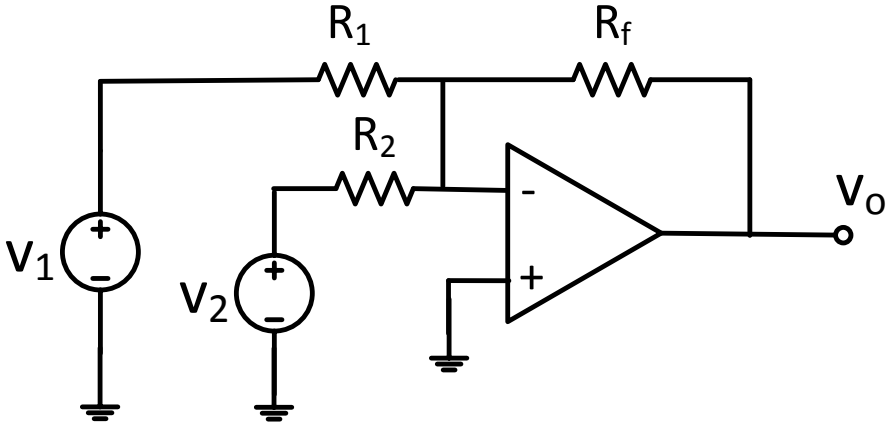
$$V_o = \frac{R_F}{R_1}(V_2 - V_1)$$

Difference Circuit



$$V_o = \frac{R_F}{R_1}(V_2 - V_1)$$

Summing Amplifier



$$V_o = G_1 V_1 + G_2 V_2$$

$$G_1 = -\frac{R_F}{R_1} \quad G_2 = -\frac{R_F}{R_2}$$

Summary

- Gain: $V_o = GV_{in}$
- Amplifier Circuit Configurations
  - Non-Inverting Amplifier
  - Inverting Amplifier
  - Difference Amplifier
  - Summing Amplifier

Next Lesson

- Differentiators and Integrators