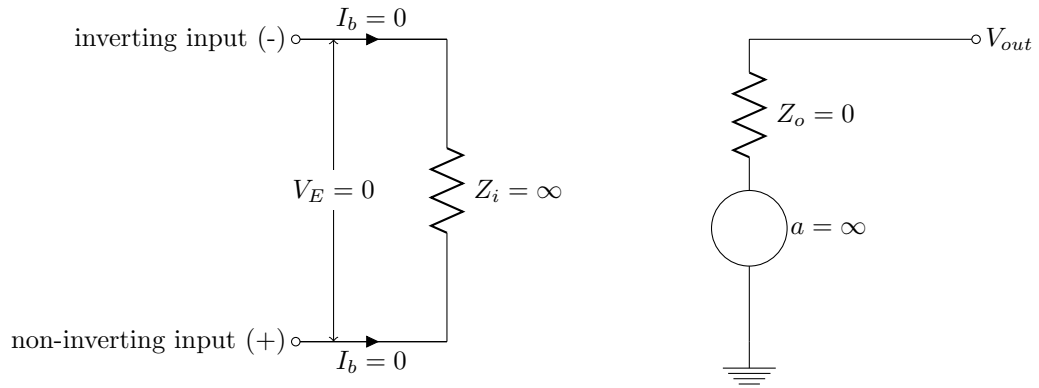


Op-Amps

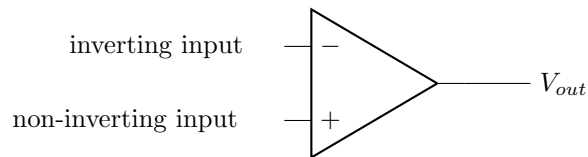
- Ideal model



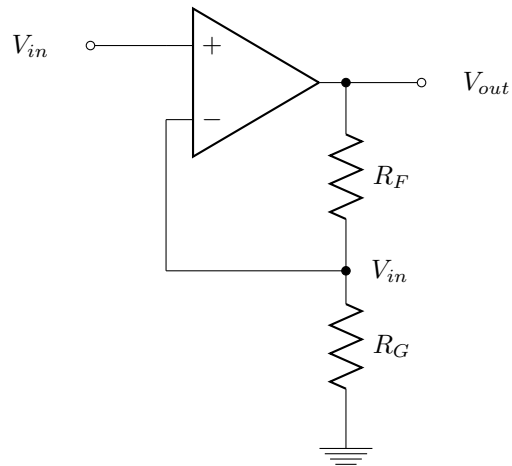
- Ideal characteristics

Parameter	Value
Input current	0
Input impedance $Z_i$	$\infty$
Output impedance $Z_o$	0
Gain	$\infty$

- Symbol



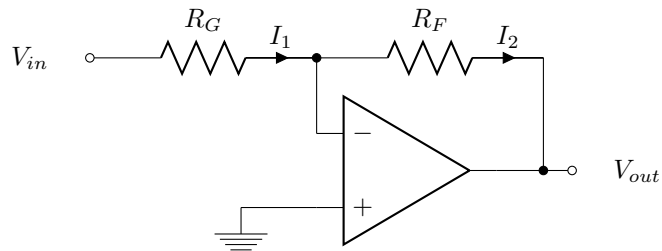
- Non-inverting amplifier



$$V_{in} = V_{out} \frac{R_G}{R_G + R_F} \quad (1)$$

$$\frac{V_{out}}{V_{in}} = 1 + \frac{R_F}{R_G} \quad (2)$$

- Inverting amplifier



$$I_1 = I_2 = \frac{V_{in}}{R_G} = -\frac{V_{out}}{R_F} \quad (3)$$

$$\frac{V_{out}}{V_{in}} = -\frac{R_F}{R_G} \quad (4)$$