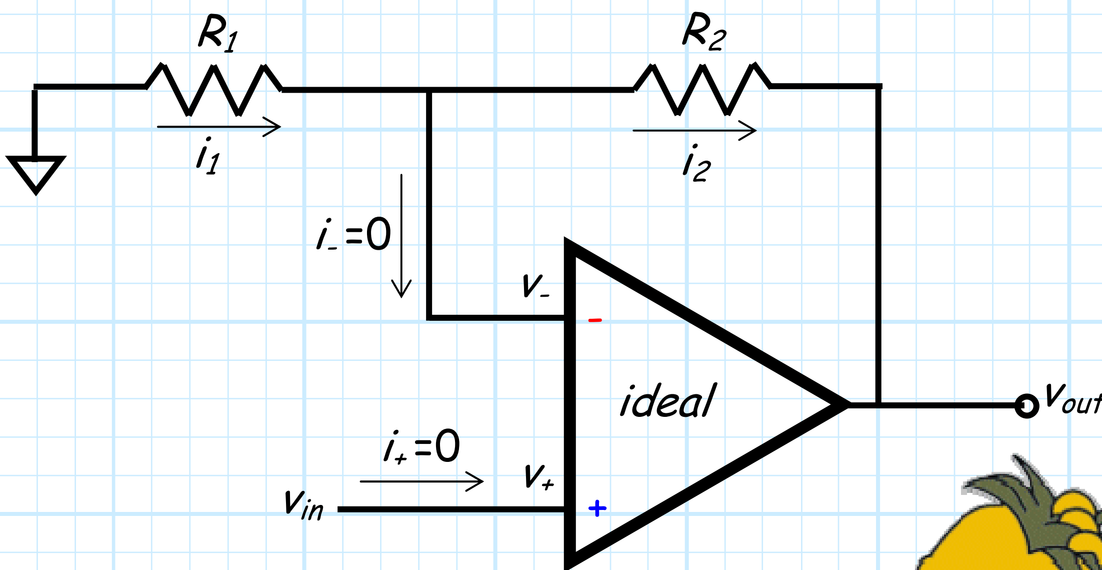
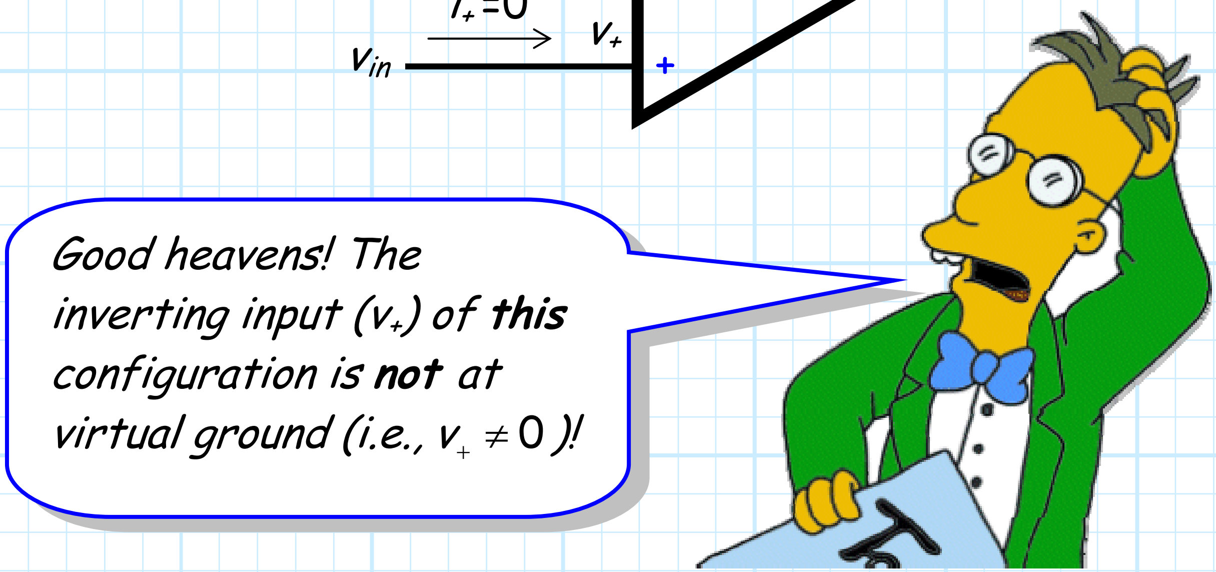
The Non-Inverting Configuration





Recall that $v_- = v_+$ (the virtual **short**) ALWAYS for feedback amplifiers.

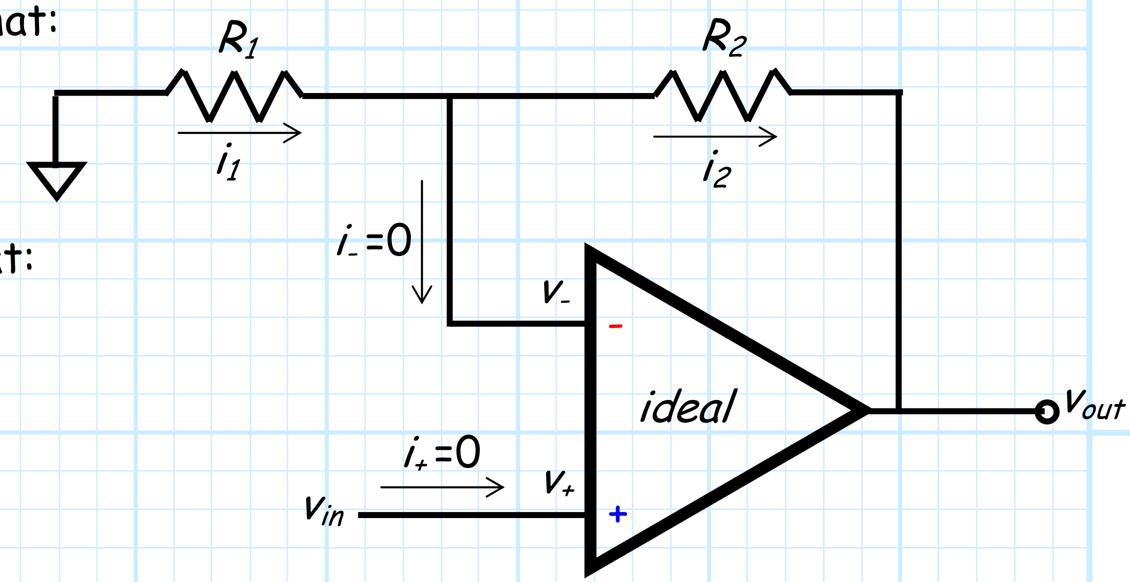
No virtual ground here!

Notice also that for the circuit above, the voltage at the **non-inverting** terminal is the **input** voltage v_{in}:

$$\therefore \quad v_- = v_{in} \neq 0$$

We use this fact to **analyze** this non-inverting configuration.

First, we use **KCL** to determine that:



$$i_1 = i_- + i_2$$

and since $i_- = 0$, we again find that:

$$i_1 = i_2$$

and from **Ohm's Law**:

$$i_1 = \frac{0 - v_-}{R_1} = \frac{-v_-}{R_1} \qquad\qquad i_2 = \frac{v_- - v_{out}}{R_1}$$

$i_- = 0$ is the key

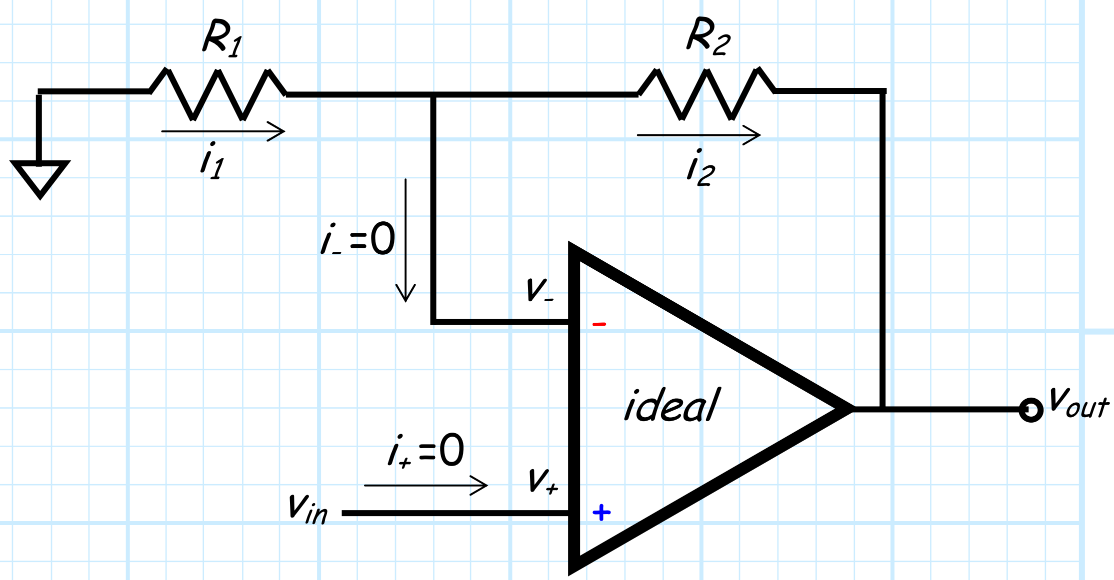
These results are of course **very similar** to the expressions we derived when analyzing the **inverting** configuration.

The main difference is of course that v_- is **not** equal to zero.

Instead, we know that $v_- = v_{in}$. Thus:

$$i_1 = \frac{-v_{in}}{R_1} \qquad i_2 = \frac{v_{in} - v_{out}}{R_1}$$

and since $i_1 = i_2$, we determine a relationship involving v_{in} and v_{out} **only**:



$$\frac{-v_{in}}{R_1} = \frac{v_{in} - v_{out}}{R_2}$$

Note the gain is a positive number

Performing some simple algebra, we rearrange this expression and find the **open-circuit voltage gain** of the **non**-inverting configuration:

$$A_{vo} = \frac{v_{out}^{oc}}{v_{in}} = 1 + \frac{R_2}{R_1}$$