

Operational Amplifiers (Op Amps) - Addendum

E80 – 2/18/13 - Professor Katherine Candler

Example 12: Non-Inverting Amplifier

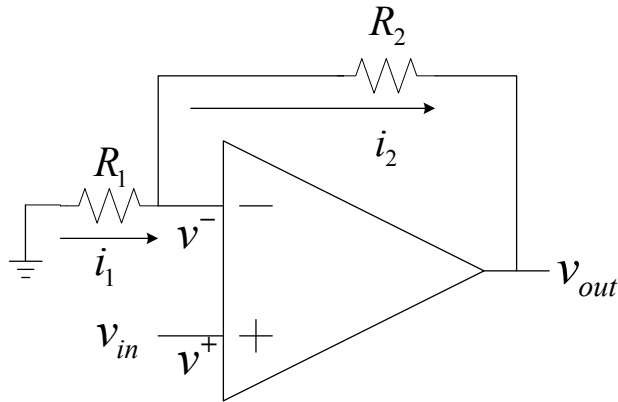


Figure 21. Non-inverting amplifier

Consider the circuit in Figure 21. Because no current flows into either input of the op amp (characteristic 1), $i_1 = i_2$.

Writing the currents in terms of voltages, we get:

$$i_1 = i_2$$

$$\frac{0 - v^-}{R_1} = \frac{v^- - v_{out}}{R_2}$$

Since the voltages at v^+ and v^- are the same (characteristic 2) and $v^+ = v_{in}$, $v^- = v_{in}$. Substituting into the previous equation, we get:

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

$$\frac{v_{out}}{v_{in}} = \frac{R_1 + R_2}{R_1} = 1 + \frac{R_2}{R_1}$$

So, for example, if $\frac{R_2}{R_1} \gg 1$, $v_{out} \approx \frac{R_2}{R_1} v_{in}$ (the output is amplified by a factor of $\frac{R_2}{R_1}$).

Note that the voltage of the amplified output cannot exceed the voltage of the external supplies.