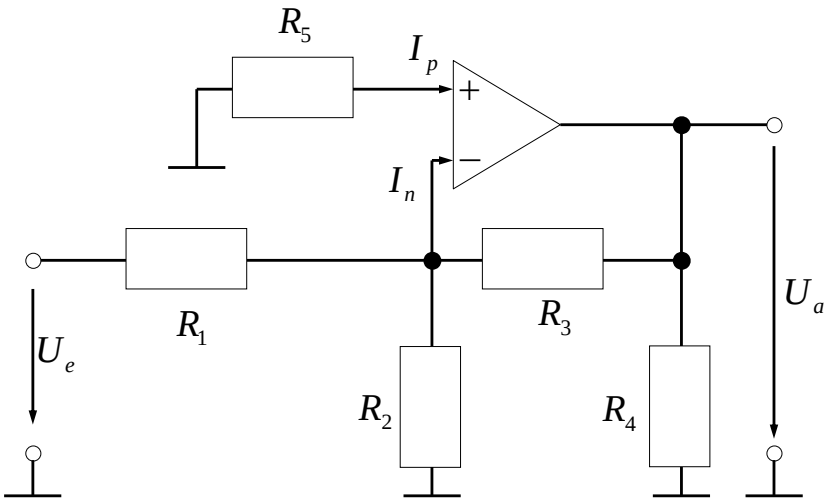
non ideal operational amplifier

Within this exercise the input bias currents I_p and I_n of a real operational amplifier will be considered.



a) Is the operational amplifier working as inverting or non-inverting amplifier?

b) Give an estimate value for the input bias currents I_n and I_p of a real operational amplifier. What is the order of magnitude for a real operational amplifier?

c) How the bias currents I_n and I_p can be considered by using the model of an ideal operational amplifier? Redraw the given circuit using the model of the ideal operational amplifier by also considering the input bias currents.

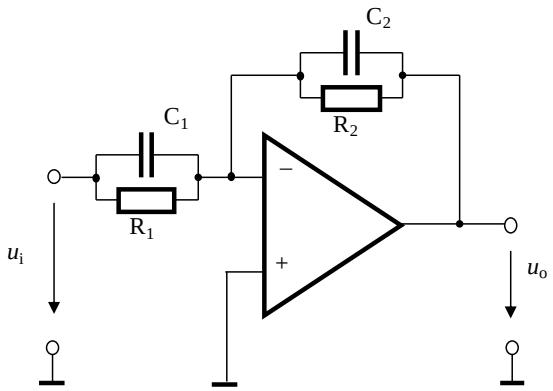
d) Calculate the voltage U_a depending on U_e with also considering the bias currents I_n und I_p.

e) What is the meaning of R_5?

f) The input bias currents should be compensated. Calculate the value of R_5 so that input bias currents do not cause an influence on the output voltage U_a.

general analog filters

A method for realizing filters, an integrator and a differentiator will be considered.



a) Calculate the transfer function of the circuit. The operational amplifier is assumed to be ideal.

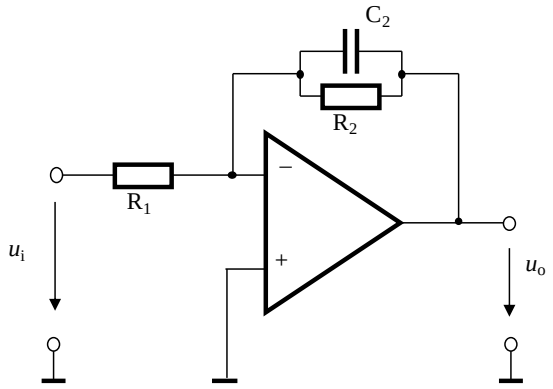
b) Under witch conditions the circuit will become
   - An integrator
   - A differentiator?

c) Plot the bode diagram of an ideal integrator and an ideal differentiator.

d) What happens when replacing capacitor C_2 by an inductor L?

design of simple filter circuit

A certain transfer function should be realized with this operational amplifier circuit. The value of the resistor R_2 is 100kΩ.



a) Calculate the values of the remaining unknown elements. These conditions must be fulfilled:
   - At a frequency of 0Hz the absolute value of the amplification is 100.
   - At a frequency of 1MHz the absolute value of the amplification is 1.

b) At which frequency the value of the amplification is 50?