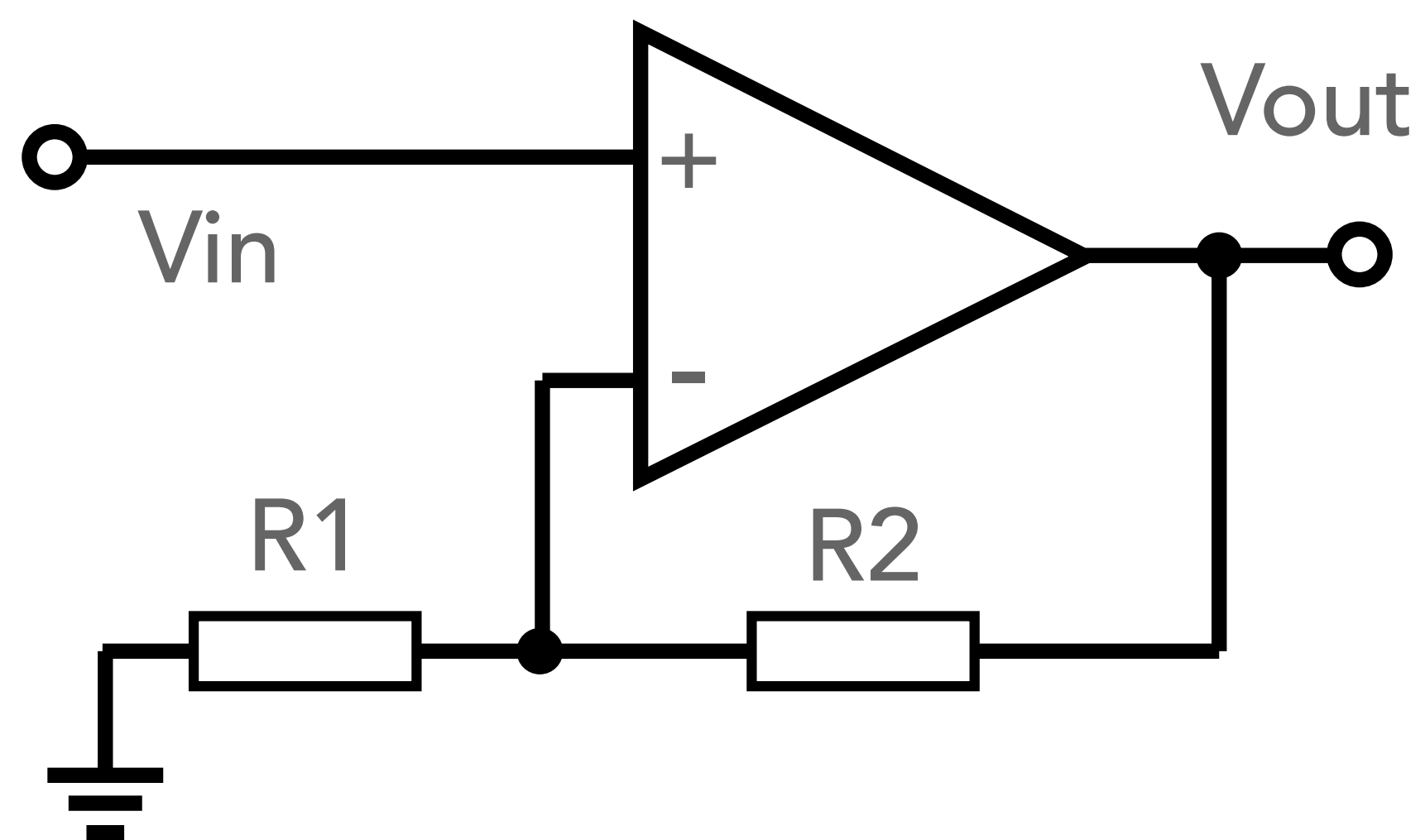


Common Operational Amplifier Circuits

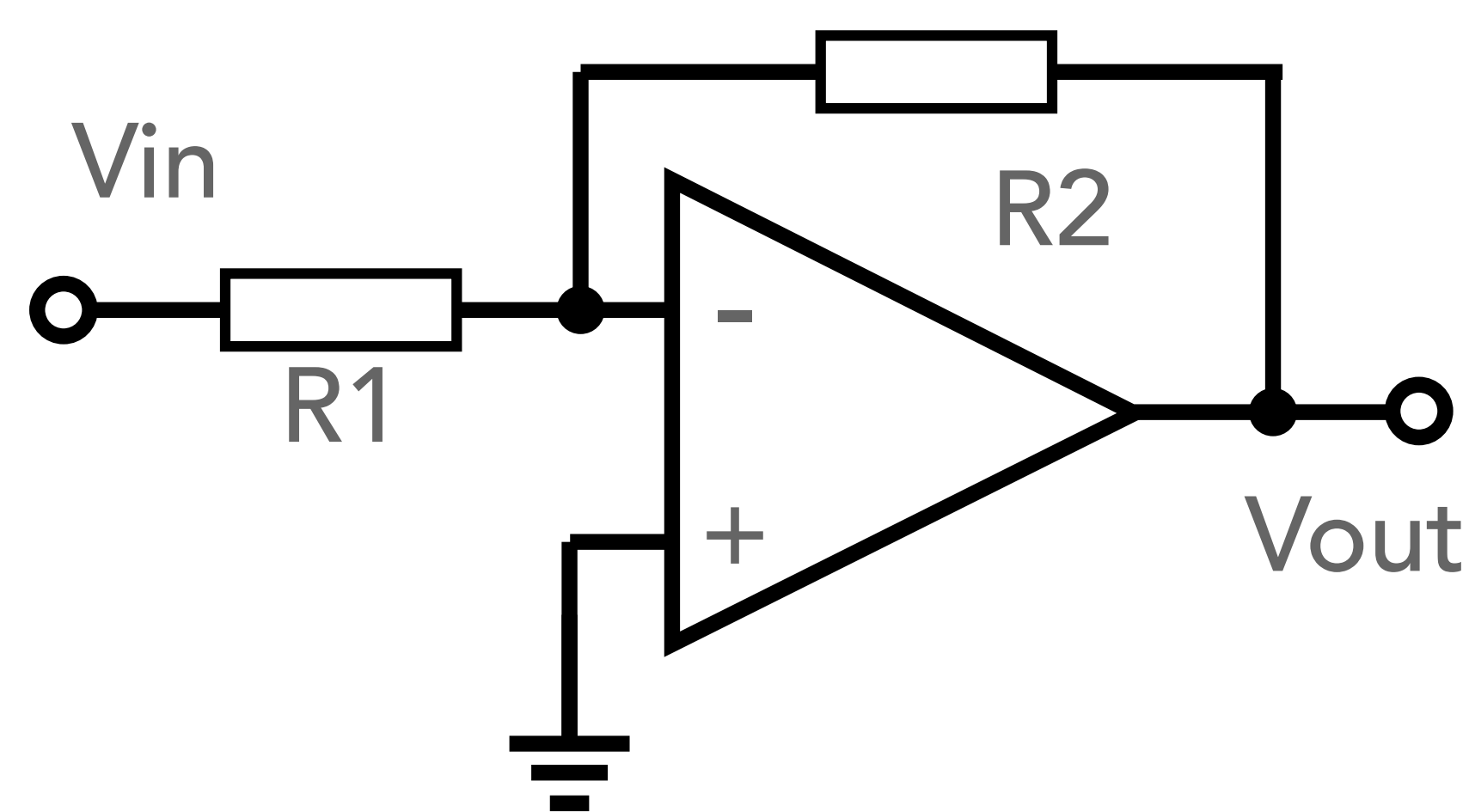
Operational amplifier chips provide an ideal building block for many circuit designs. I've put together a selection of some of the more commonly used circuits used for various electronic scenarios.

Non-inverting amplifier



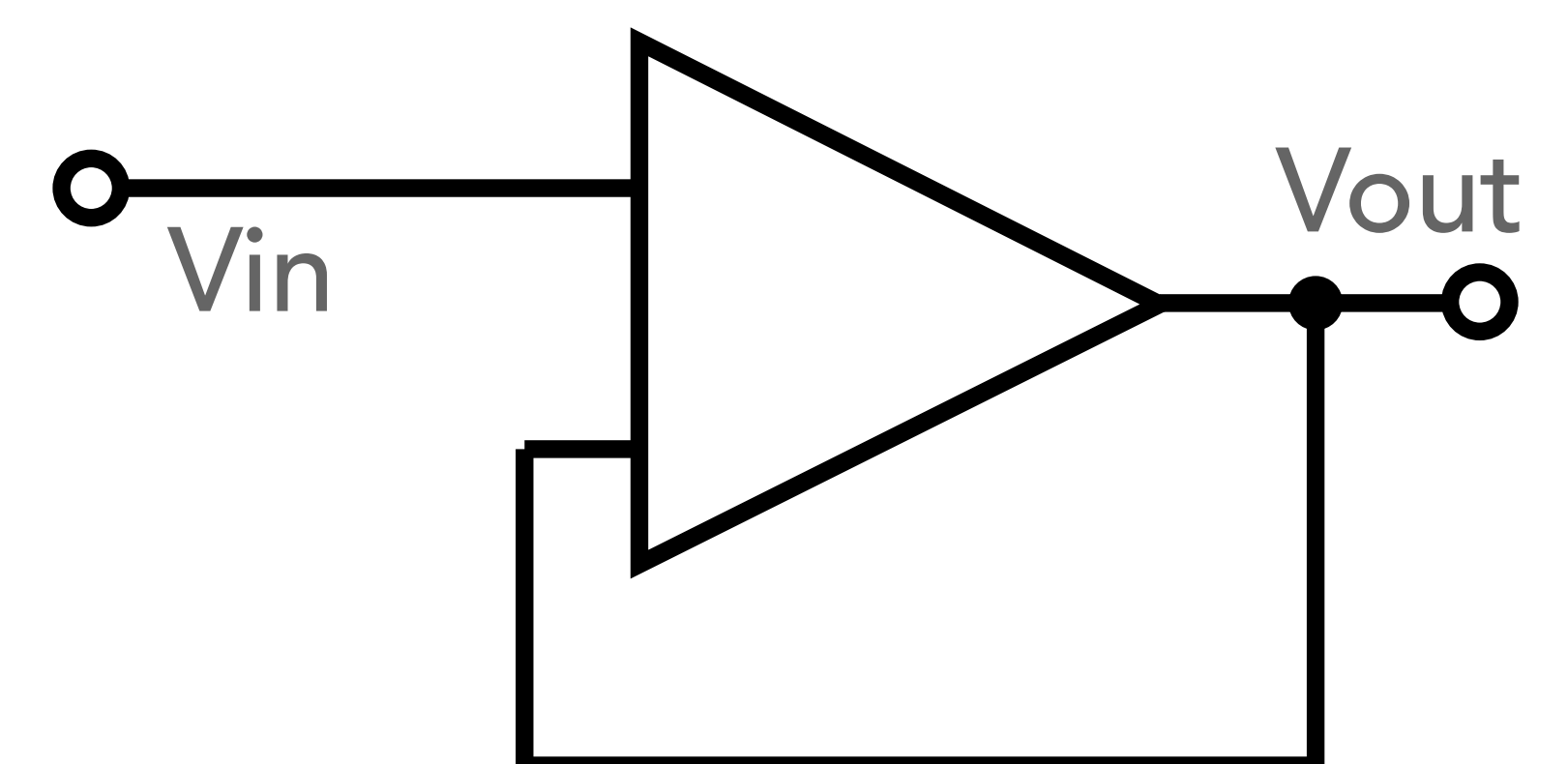
$$V_{out} = V_{in} \left(1 + \frac{R_2}{R_1} \right)$$

Inverting amplifier



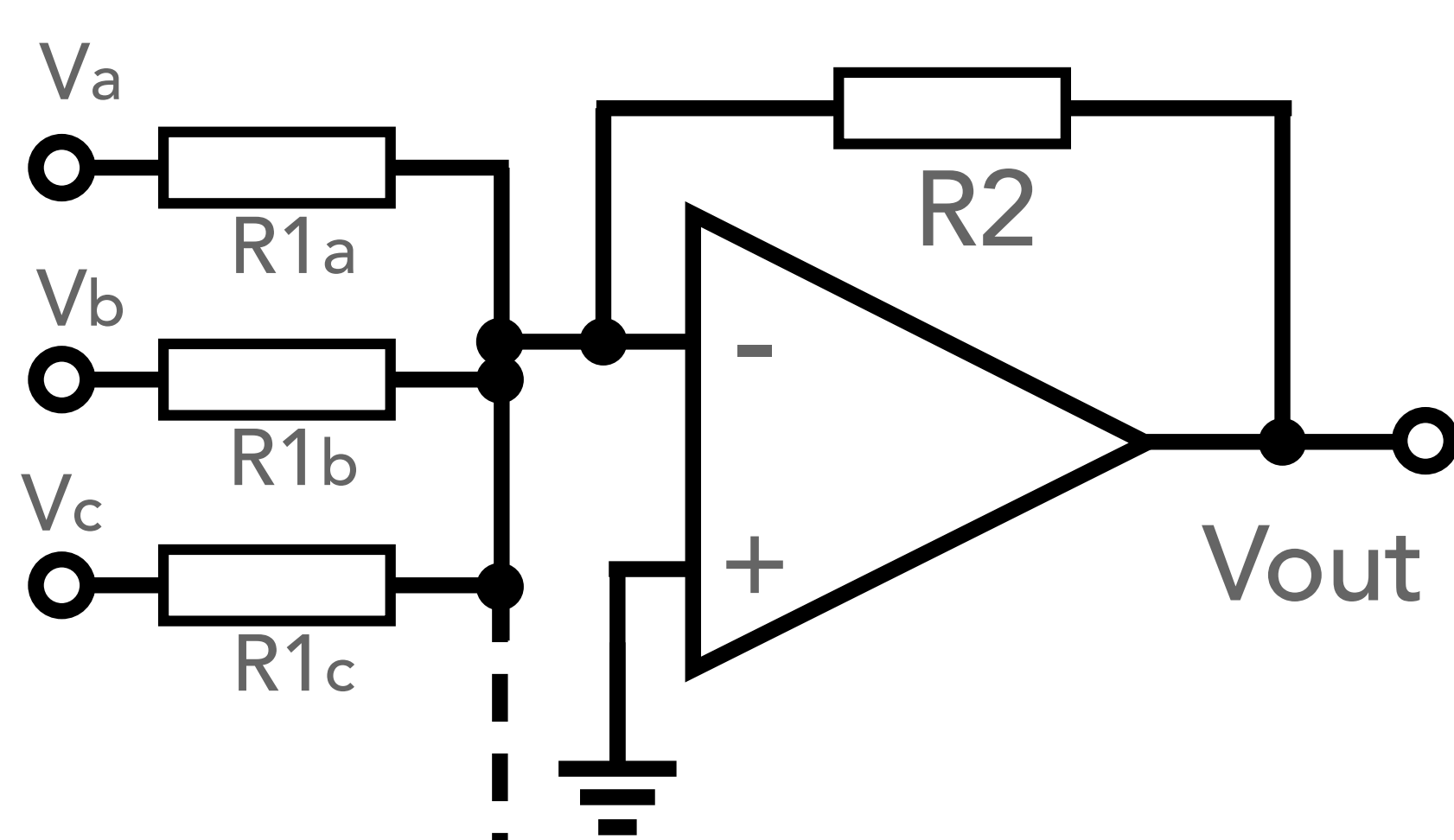
$$V_{out} = - V_{in} \frac{R_2}{R_1}$$

Voltage Follower



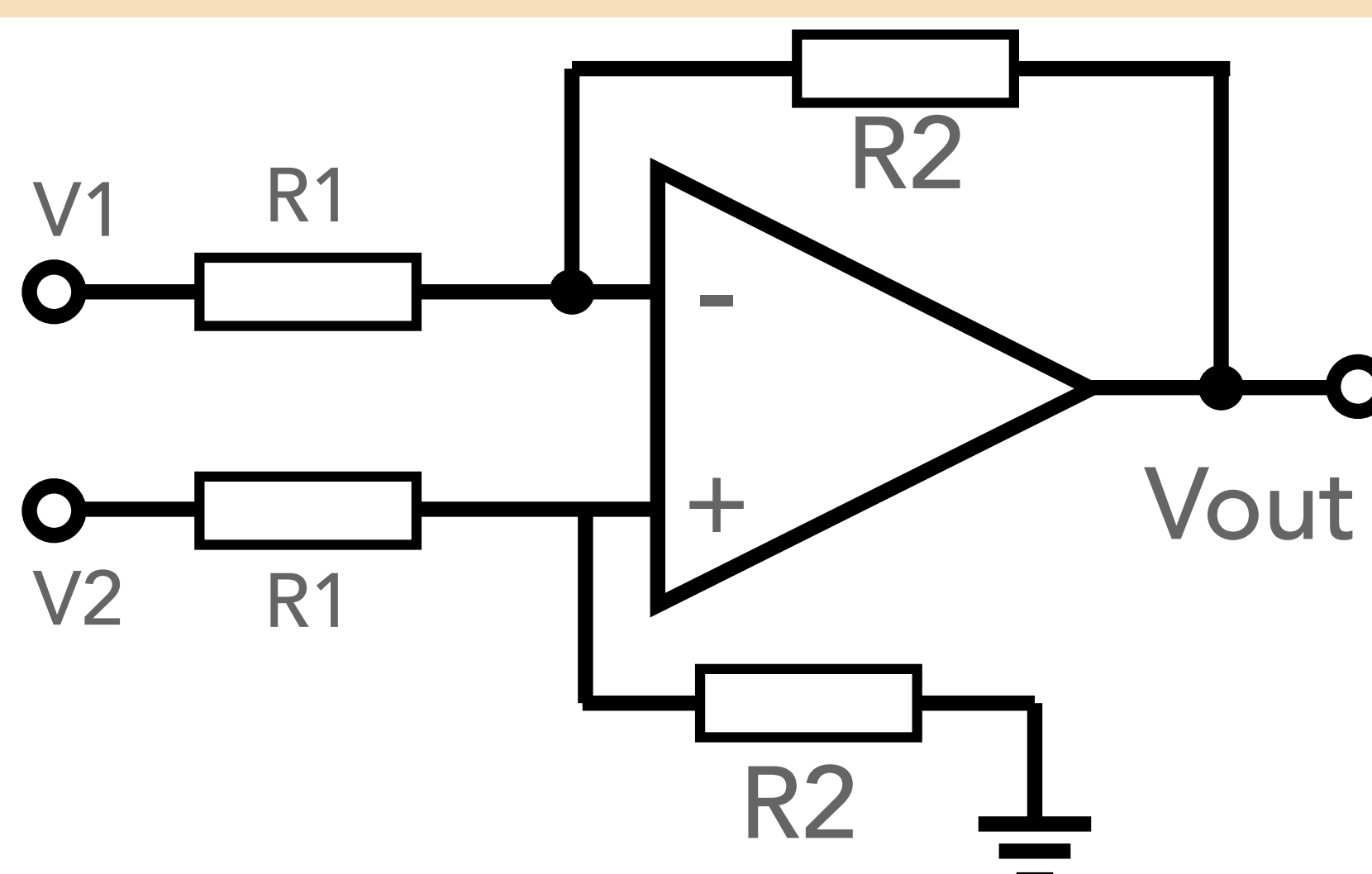
$$V_{out} = V_{in}$$

Summing amplifier



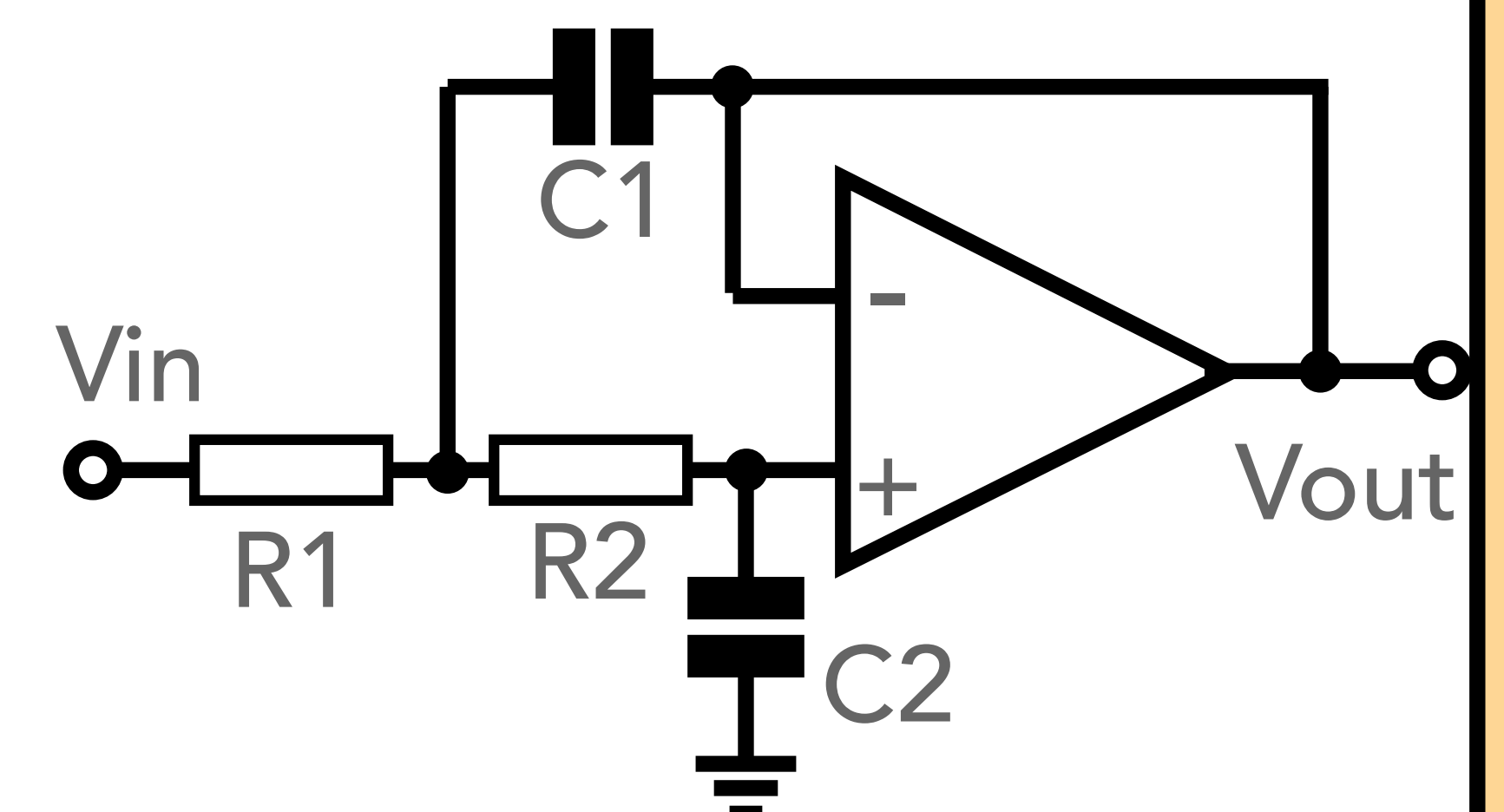
$$V_{out} = V_a \frac{R_2}{R_{1a}} + V_b \frac{R_2}{R_{1b}} + \dots$$

Difference amplifier



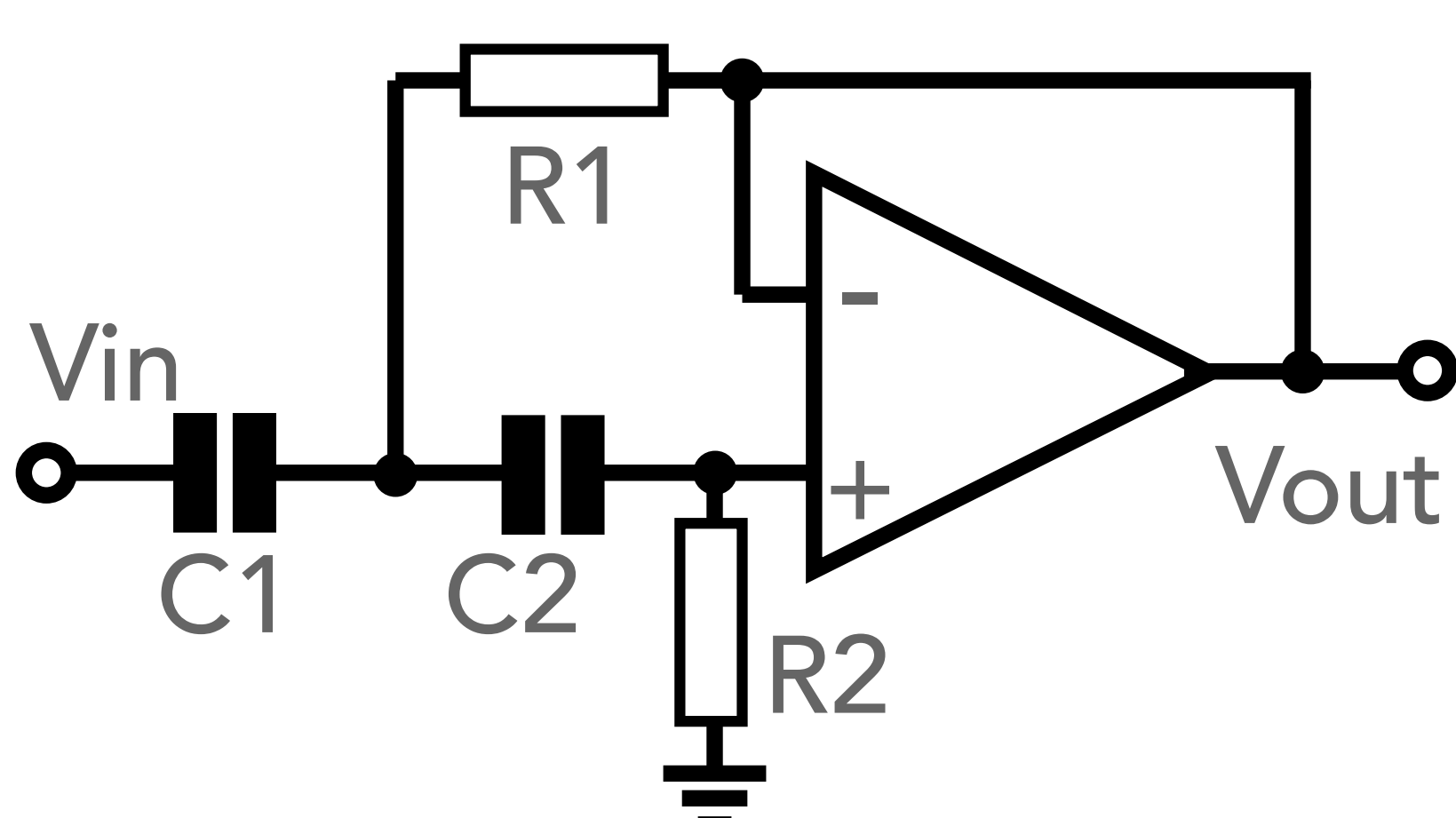
$$V_{out} = \frac{R_2}{R_1} (V_2 - V_1)$$

Low Pass Filter



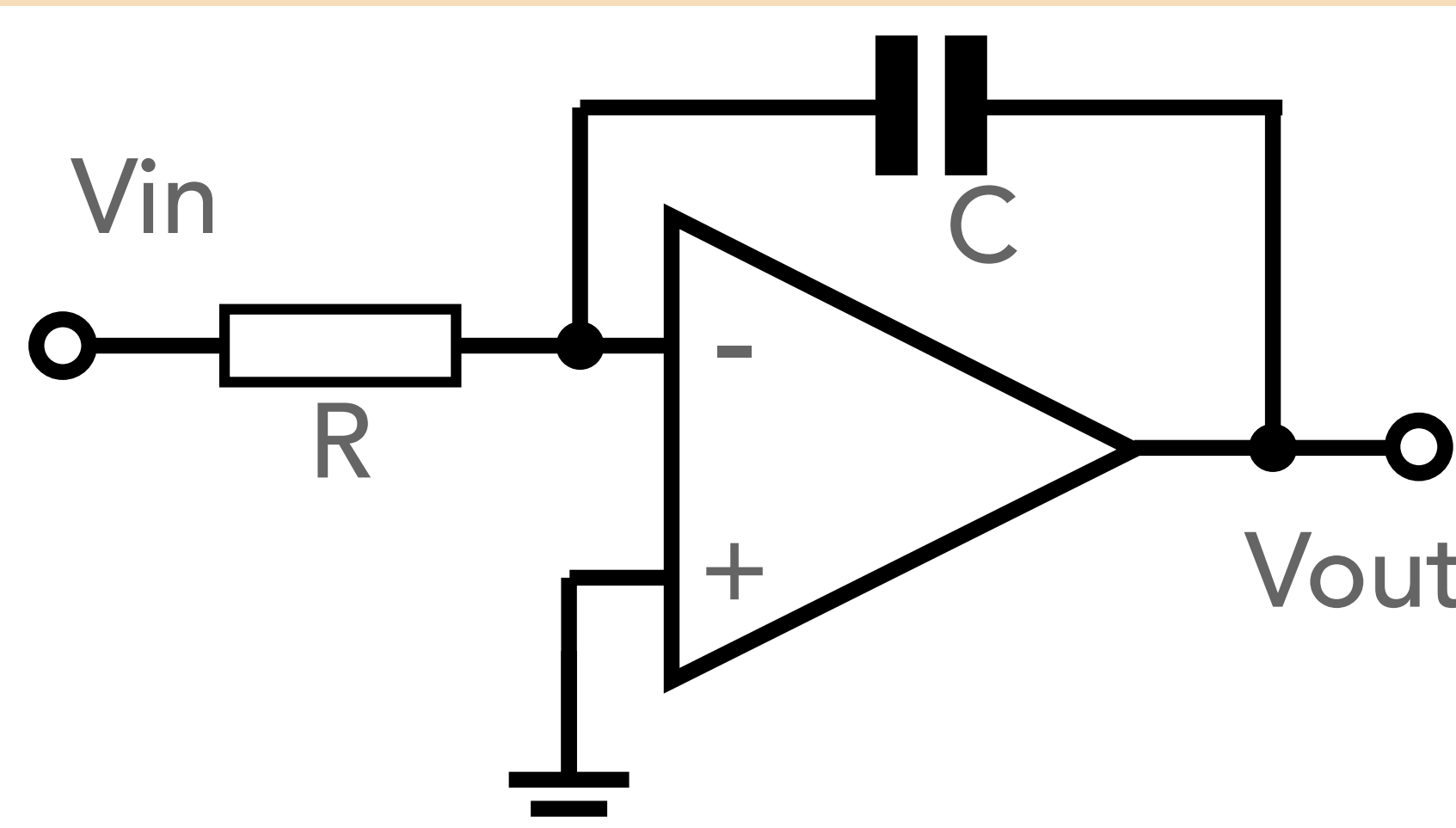
$$R_1 = R_2 \quad f = \frac{\sqrt{2}}{4 \pi R C_2}$$
$$C_1 = 2C_2$$

High Pass Filter



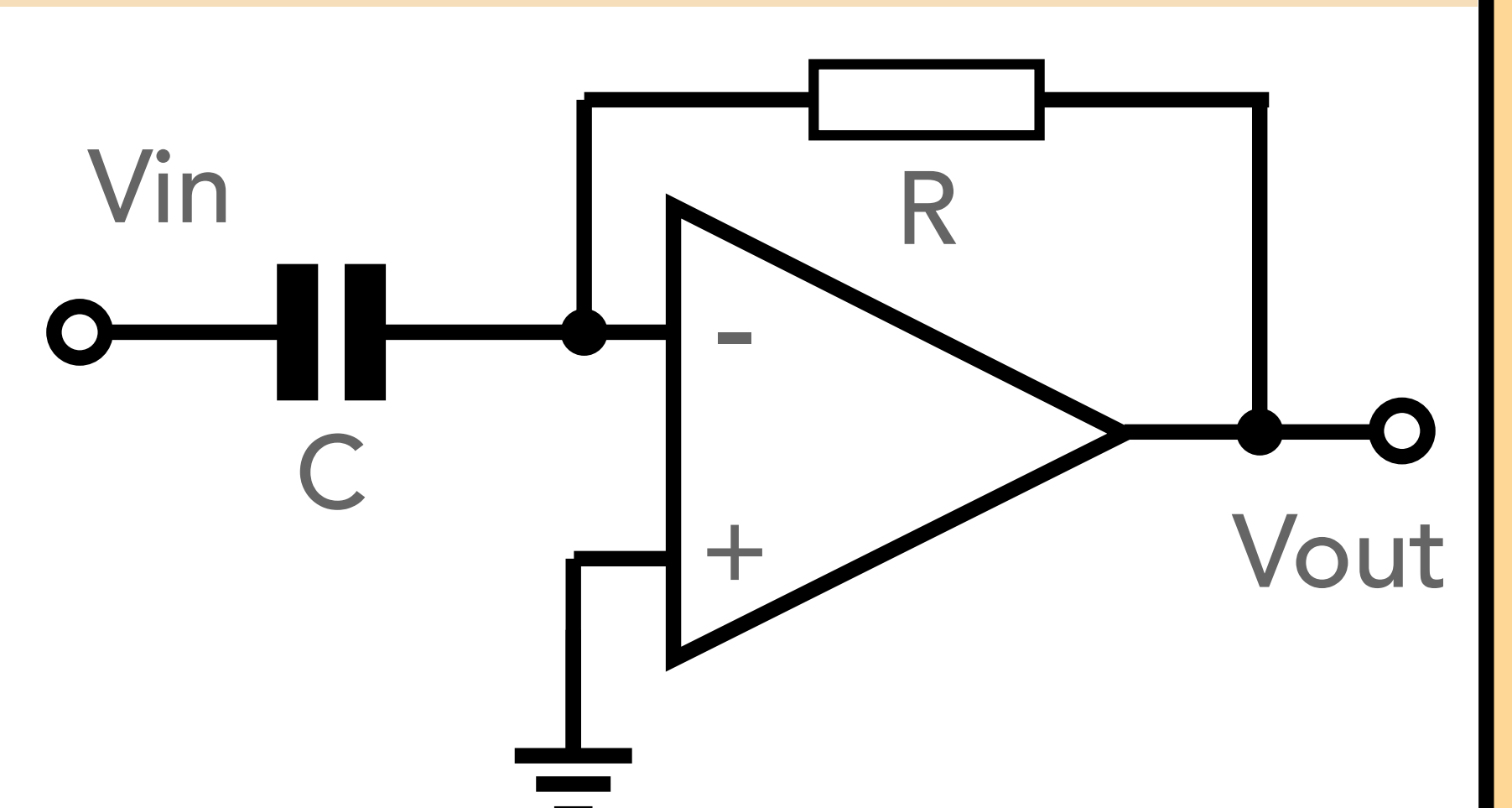
$$R_1 = R_2 \quad f = \frac{\sqrt{2}}{4 \pi R C_2}$$
$$C_1 = 2C_2$$

Integrator



$$V_{out} = - \int_0^t \frac{V_{in}}{R C} dt + c$$

Differentiator



$$V_{out} = - R C \frac{dV_{in}}{dt}$$