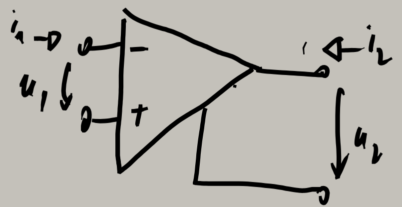
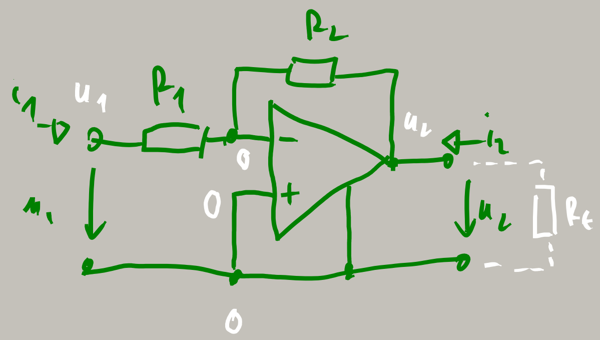
Ideális erősítő



← ide nem tudunk egyenletet felírni



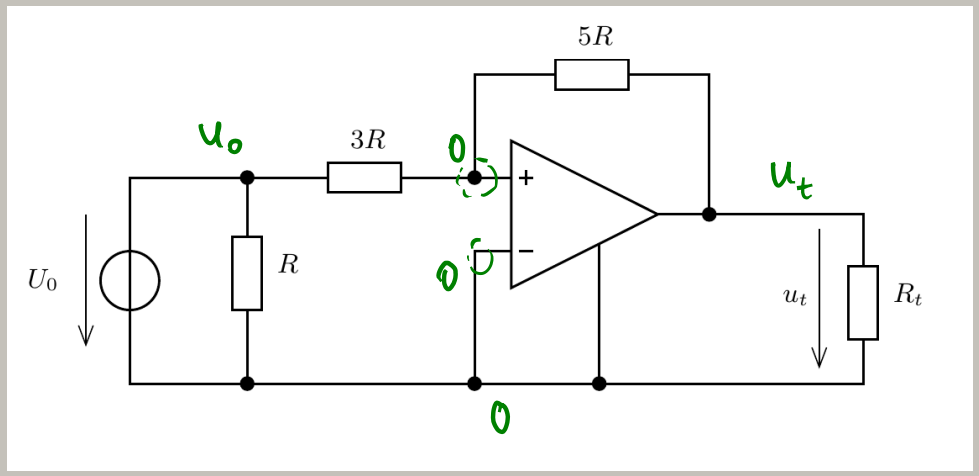
$u_1 = 0 \longrightarrow$ + és − azonos potenciálon

$i_1 = 0 \longrightarrow$ nincs befolyó áram

$$\frac{0-u_1}{R_1} + \frac{0-u_2}{R_2} = 0$$

$$u_2 = -\frac{R_2}{R_1} \cdot u_1$$

$$\boxed{\frac{u_2}{u_1} = -\frac{R_2}{R_1}}$$

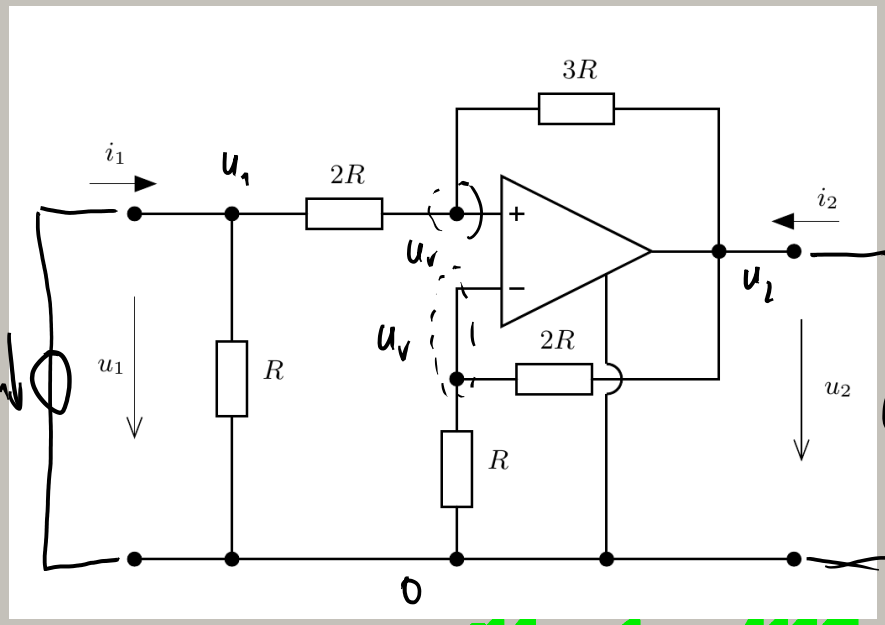


$U_0 = 10\,V$; $R = 2\,k\Omega$; $R_t = 4\,k\Omega$

$$\frac{0-u_0}{3R} + \frac{0-u_t}{5R} = 0$$

$$u_t = -\frac{5R}{3R}\cdot u_0 = -\frac{5}{3}u_0$$

$$u_t = -16{,}66\,V$$



$$\begin{pmatrix} i_1 \\ u_2 \end{pmatrix} = \underline{K} \cdot \begin{pmatrix} u_1 \\ i_2 \end{pmatrix}$$

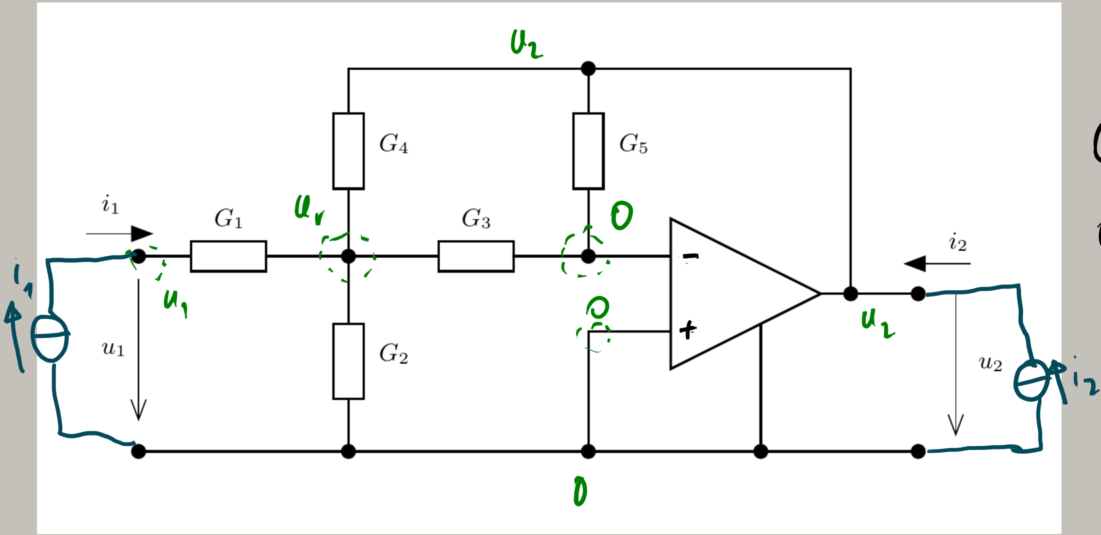
① $\frac{u_v}{R} + \frac{u_v - u_2}{2R} = 0 \rightarrow u_v = \frac{u_2}{3}$

② $-i_1 + \frac{u_1}{R} + \frac{u_1 - u_v}{2R} = 0$

③ $\frac{u_v - u_1}{2R} + \frac{u_v - u_2}{3R} = 0$

→ megoldás (① és ③) $u_2 = -9u_1$ $i_1 = \frac{3}{R}u_1$

$$\underline{K} = \begin{pmatrix} 3/R & 0 \\ -9 & 0 \end{pmatrix}$$



$i = G \cdot u = \frac{1}{R} \cdot u$

① $-i_1 + G_1 \cdot (u_1 - u_v) = 0$

② $G_3(0 - U_v) + G_5(0 - U_2) = 0$

③ $G_1(u_v - u_1) + G_2 \cdot u_v +$
$+ G_3(u_v) + G_4 \cdot (u_v - u_2) = 0$

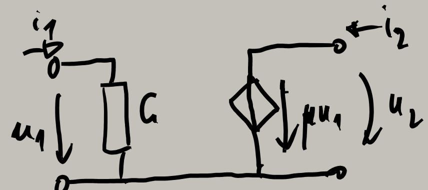
③ → $U_v = \square\, u_1 + \bigcirc\, u_2$

① → $i_1 = \bigcirc\, u_1$

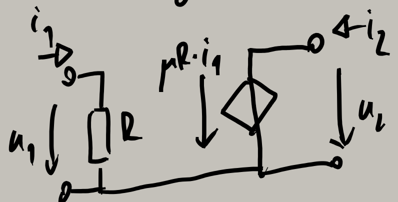
② $u_2 = \dfrac{-G_1}{G_4 + \frac{G_5}{G_3} \cdot (G_1 + G_2 + G_3 + G_4)} \cdot u_1$

Ⓘ $i_1 = G \cdot u_1$
Ⓘⓘ $u_2 = \mu\, u_1$
} invertibilis függvények.

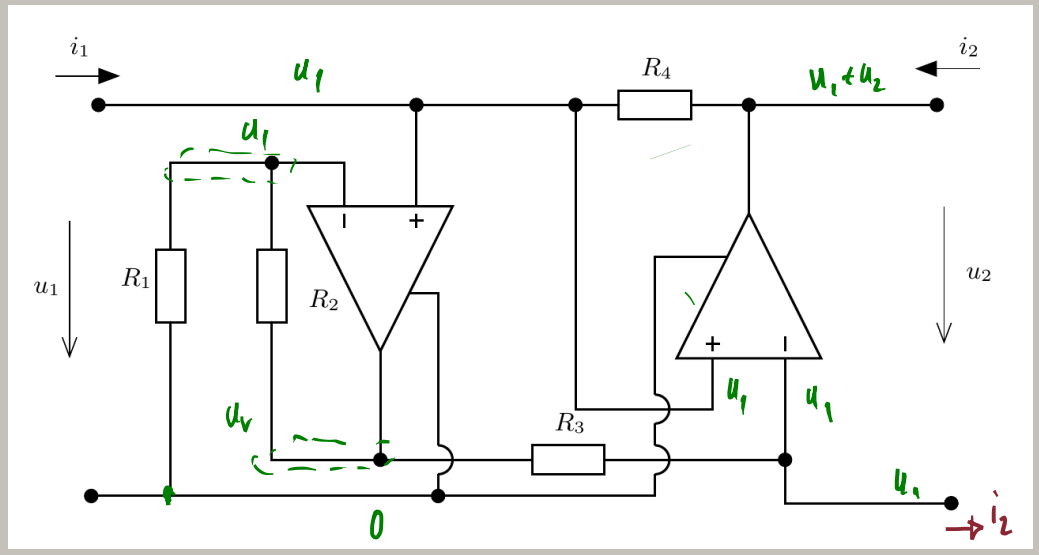
↳
$u_1 = \frac{1}{G} \cdot i_1 = R \cdot i_1$
$u_2 = \mu \cdot R \cdot i_1$



feszültségvezérelt feszültségforrás



áramvezérelt feszültségforrás



$R \to$

① $-i_1 + \dfrac{u_1 - (u_1+u_2)}{R_4} = 0$

② $i_2 + \dfrac{u_1 - u_v}{R_3} = 0$

③ $\dfrac{u_1}{R_1} + \dfrac{u_1 - u_v}{R_2} = 0$

③ $\Rightarrow u_v = \left(1 + \dfrac{R_2}{R_1}\right) u_1$

① $-i_1 + \dfrac{-u_2}{R_4} = 0 \Rightarrow u_2 = -R_4 i_1$

② $i_2 + \dfrac{1}{R_3}\left(u_1 - \dfrac{R_1+R_2}{R_1} \cdot u_1\right) = 0 \Rightarrow u_1 = \dfrac{R_1 R_3}{R_2} \cdot i_2$

$$u_1 = \frac{R_1 R_3}{R_2} \cdot i_2$$

$$u_2 = -R_4 \cdot i_1$$

girátor $\begin{cases} u_1 = -r \cdot i_2 \\ u_2 = r \cdot i_1 \end{cases} \longrightarrow$ $\dfrac{-(R_1 R_3)}{R_2} = -R_4 \Rightarrow$ $R_1 R_3 = R_2 R_4$

teljesülése esetén

girátor, akkor $r = -R_4$ vagy $r = -\dfrac{R_1 R_3}{R_2}$