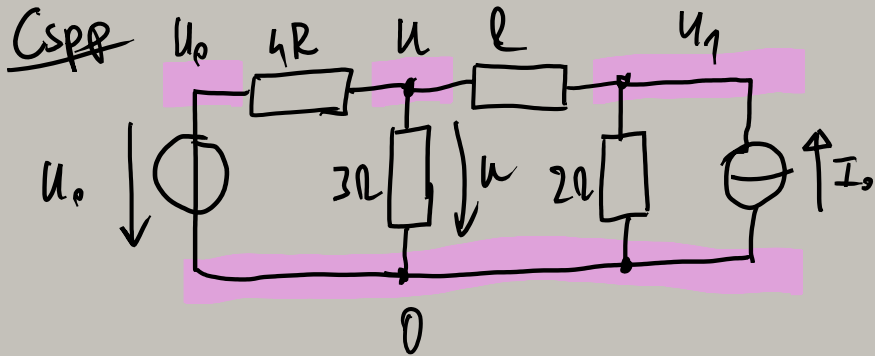
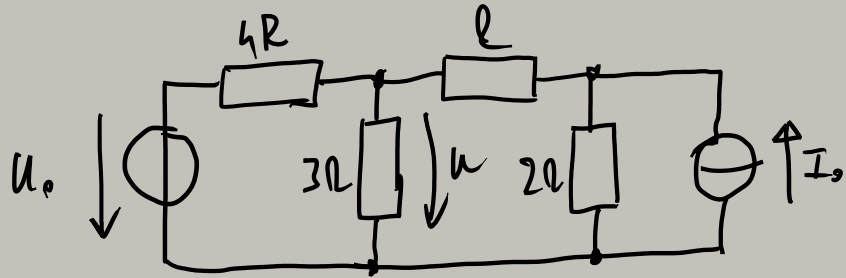


Bemerkung: fehlt

$$U_0 = 12V; I_0 = 2mA; R = 2k\Omega$$

$$V_1 \text{ mA, k}\Omega$$



$$\left. \begin{aligned} \left(\frac{1}{4R} + \frac{1}{3R} + \frac{1}{R}\right)u + \left(-\frac{1}{R}\right)u_1 &= \frac{1}{4R} \cdot U_0 \\ \left(-\frac{1}{R}\right) \cdot u + \left(\frac{1}{R} + \frac{1}{2R}\right)u_1 &= I_0 \end{aligned} \right\}$$

4 db csp  $\Rightarrow$  2 db ismentler

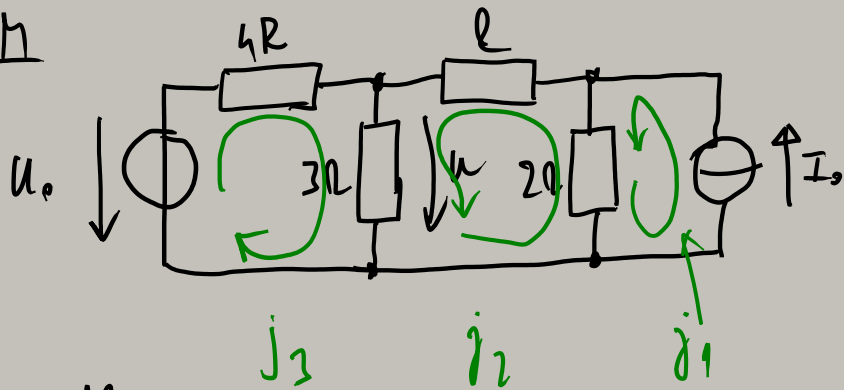
$$\frac{u - u_1}{4R} + \frac{u}{3R} + \frac{u - u_1}{R} = 0 \quad (1)$$

$$-I_0 + \frac{u_1}{2R} + \frac{u_1 - u}{R} = 0 \quad (2)$$

$$u = 6,1818V$$

$$u_1 = 6,7878V$$

HAM



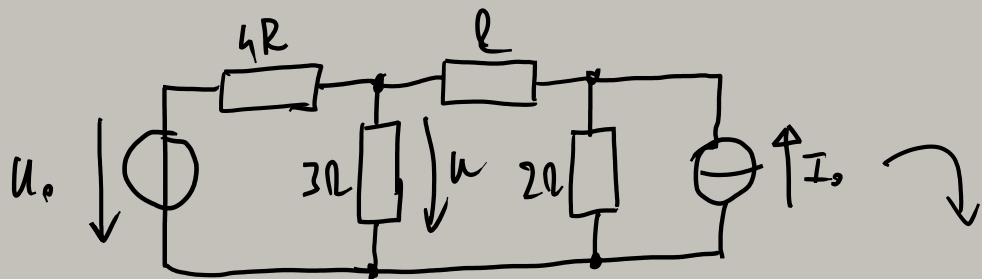
ismertlme:  $j_2, j_3$

$$\left. \begin{aligned} (2R + R + 3R) j_2 + 3R j_3 &= 2R I_0 \\ 3R j_2 + (3R + 4R) j_3 &= u_0 \end{aligned} \right\}$$

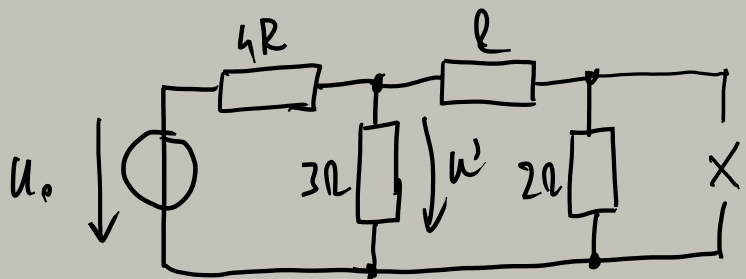
$$\left. \begin{aligned} 12 j_2 + 6 j_3 &= 8 \\ 6 j_2 + 14 j_3 &= 12 \end{aligned} \right\} \begin{aligned} j_2 &= 0,3030 \text{ mA} \\ j_3 &= 0,7272 \text{ mA} \end{aligned}$$

$$u = 3R \cdot (j_2 + j_3) = 6 \cdot \Omega \cdot (1,0302) = 6,1812 \text{ V}$$

$$\left. \begin{aligned} j_1 &= I_0 \\ 2R(j_2 - j_1) + R \cdot j_2 + 3R(j_2 + j_3) &= 0 \\ -u_0 + 4R j_3 + 3R(j_3 + j_2) &= 0 \end{aligned} \right\}$$

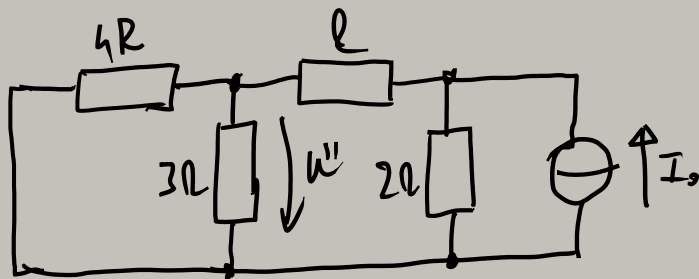


$$u = u' + u''$$



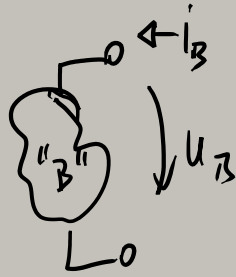
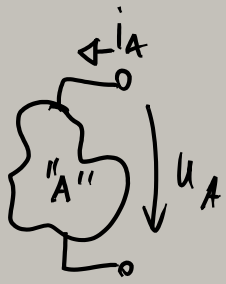
$$I_0 = 0$$

$$u' = u_0 \cdot \frac{3R \times (R + 2R)}{4R + (3R \times (R + 2R))} = u_0 \cdot \frac{3R/2}{11R/2} = \frac{3u_0}{11}$$



$$u_0 = 0$$

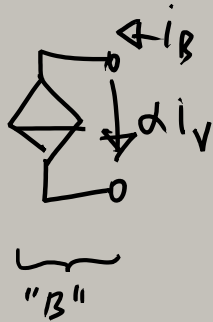
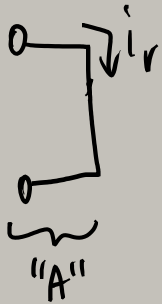
$$u'' = \frac{2R \times (R + 3R \times 4R)}{R + (3R \times 4R)} \cdot \frac{4R \times 3R}{3R} \cdot 3R = u''$$



$$u_A = f(i_A, u_B)$$

$$i_B = g(i_A, u_B)$$

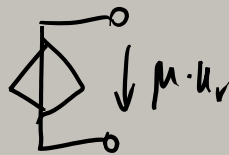
AME mit en gellezi a f is s, hory  
linearis legge us = dit hup-lus



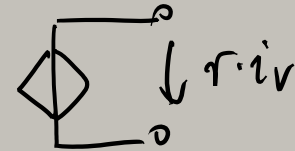
AVA/F  
 $i_B = \alpha \cdot i_v$

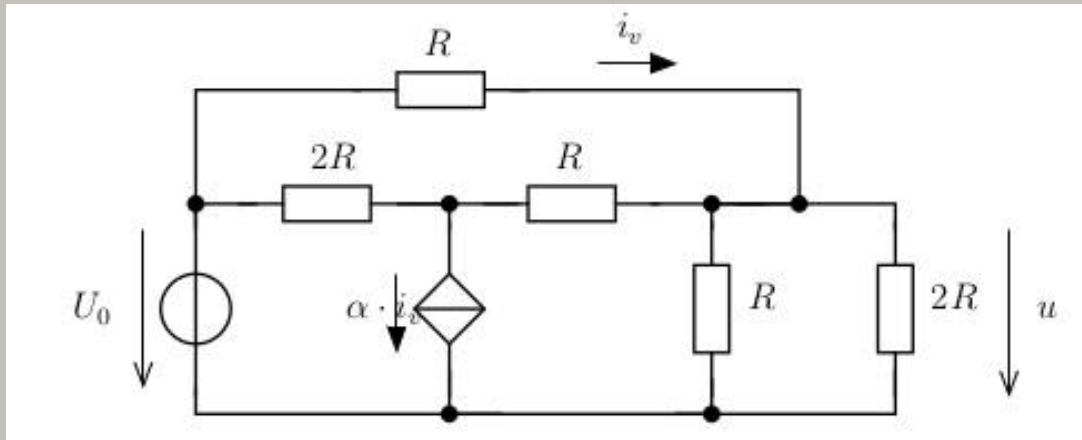


FVA/F

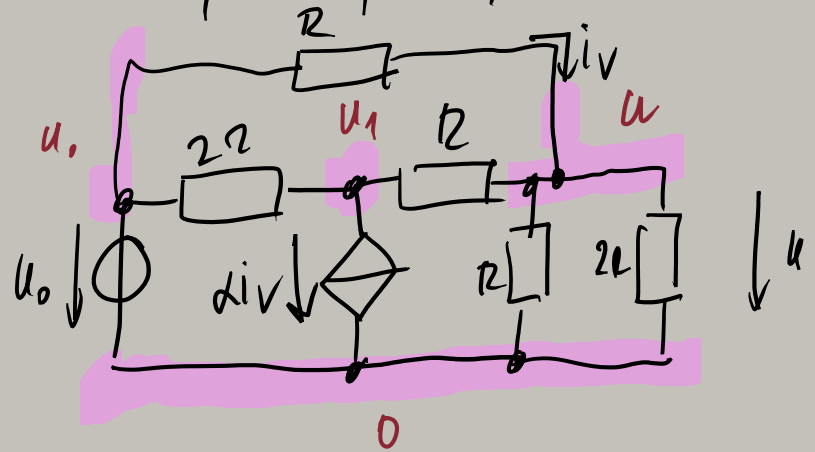


≠VFF





$$U_0 = 10V; R = 5\Omega; \alpha = 0,9$$



$$\frac{u}{2R} + \frac{u}{R} + \frac{u - u_1}{R} + \frac{u - U_0}{R} = 0$$

$$\frac{u_1 - U_0}{2R} + \frac{u_1 - u}{R} + \alpha \cdot i_v = 0$$

$$i_v = \frac{U_0 - u}{R}$$

isometrisch:  $u, u_1, i_v$

$$\begin{pmatrix} \frac{3}{R} + \frac{1}{2R} & -\frac{1}{R} & 0 \\ -\frac{1}{R} & \frac{1}{R} + \frac{1}{2R} & \alpha \\ \frac{1}{R} & 0 & 1 \end{pmatrix} \begin{pmatrix} u \\ u_1 \\ i_v \end{pmatrix} = \begin{pmatrix} U_0/R \\ U_0/2R \\ U_0/R \end{pmatrix}$$

$\underline{A} \cdot \underline{x} = \underline{B}$

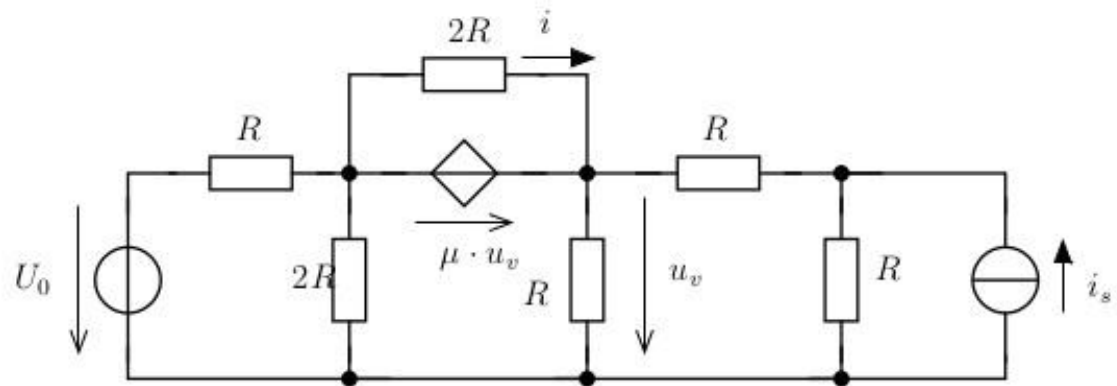
lin. system  $\underline{A} \cdot \underline{x} = \underline{B}$

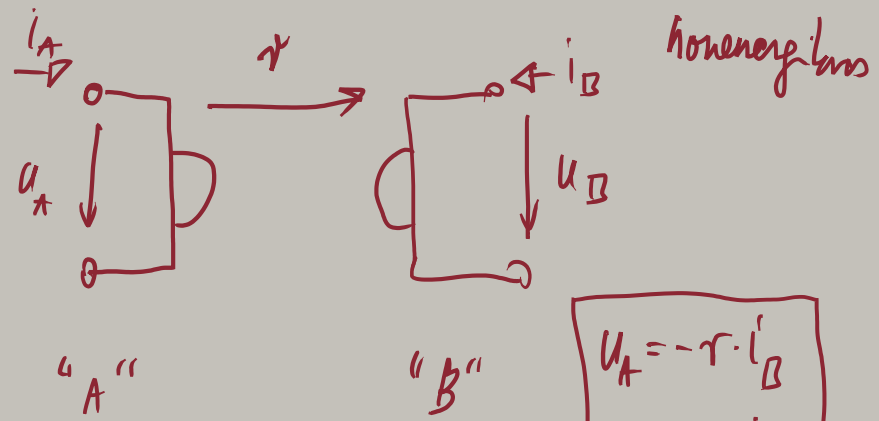
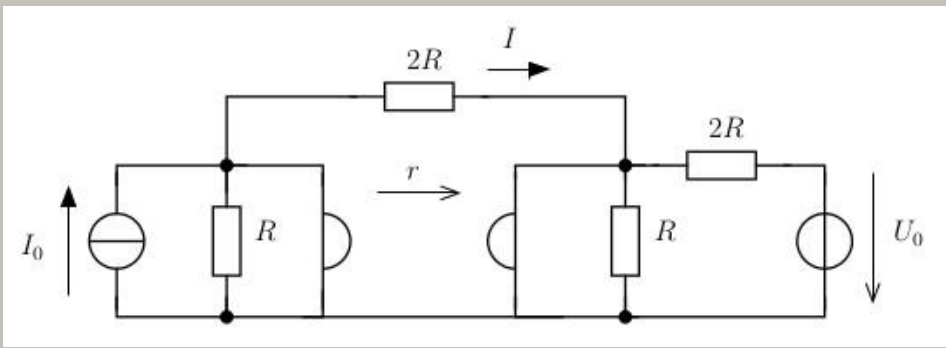
$$\underline{x} = \underline{A}^{-1} \cdot \underline{B}$$

$$\underline{x} = \begin{pmatrix} 3,2836 \text{ V} \\ 4,4925 \text{ V} \\ 1,3433 \text{ V} \end{pmatrix}$$

$\Rightarrow$

$$u = 3,2836 \text{ V}$$

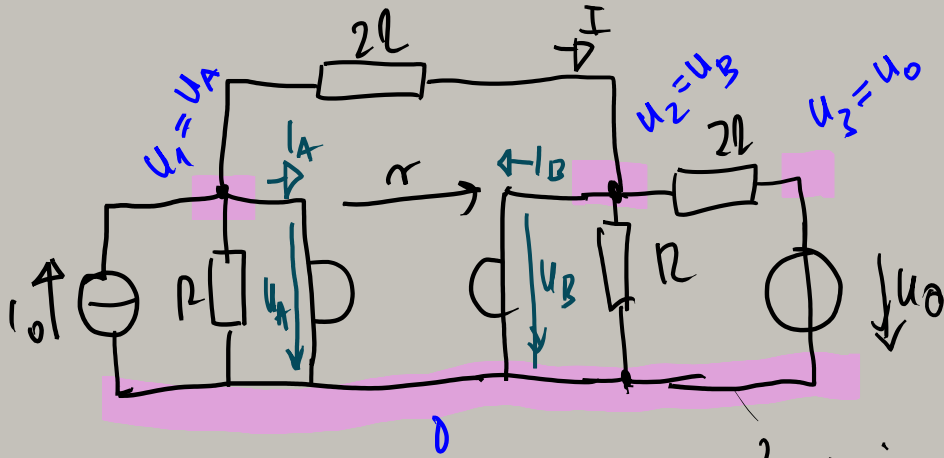




$$\begin{aligned} U_A &= -r \cdot i_B \\ U_B &= r \cdot i_A \end{aligned}$$

$$U_A i_A + U_B i_B =$$

$$U_A \cdot \frac{U_B}{r} + U_B \left( -\frac{U_A}{r} \right) = 0$$



isshemethen:  $U_A, U_B, i_A, i_B, I$

2 eq-i aqshet  
2 knndt.

$$1) -I_0 + \frac{U_A}{R} + \frac{U_A - U_B}{2R} + i_A = 0$$

$$2) \frac{U_B - U_0}{2R} + \frac{U_B}{R} + \frac{U_B - U_A}{2R} + i_B = 0$$

$$3) U_A = -r \cdot i_B$$

$$4) U_B = r \cdot i_A$$

$$i_B = -\frac{U_A}{r}$$

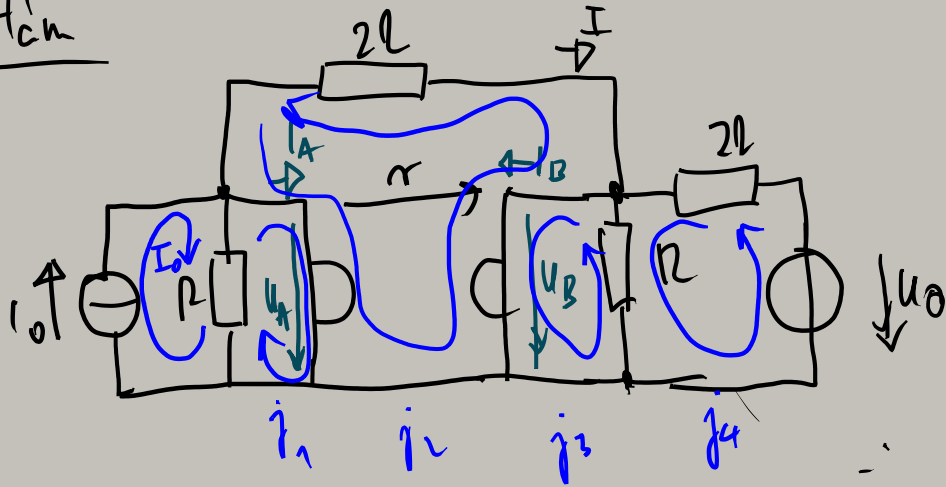
$$i_A = \frac{U_B}{r}$$

$$\left. \begin{aligned} \frac{U_B - U_0}{2R} + \frac{U_B}{R} + \frac{U_B - U_A}{2R} - \frac{U_A}{r} &= 0 & \textcircled{2} \\ -I_0 + \frac{U_A}{R} + \frac{U_A - U_B}{2R} + \frac{U_B}{r} &= 0 & \textcircled{1} \end{aligned} \right\}$$

$$\begin{pmatrix} \left( \frac{1}{R} + \frac{1}{2R} \right) & \frac{1}{r} - \frac{1}{2R} \\ -\frac{1}{r} - \frac{1}{2R} & \frac{2}{R} \end{pmatrix} \begin{pmatrix} U_A \\ U_B \end{pmatrix} = \begin{pmatrix} I_0 \\ U_0/2R \end{pmatrix}$$



H<sub>cm</sub>



ismethlene:  $j_1, j_2, j_3, j_4, u_A, u_B, u_0, I_B$

4 . h.e. + 2 h.m. + 2 kinyreepunkt

$$u_A + (j_1 - I_B) R = 0$$

$$u_A - u_B + 2L j_2 = 0$$

$$u_B + R(j_3 - j_4) = 0$$

$$R(j_4 - j_3) - u_0 + 2L j_4 = 0$$

h.m.  
epunkt

$$u_A = -r \cdot I_B$$

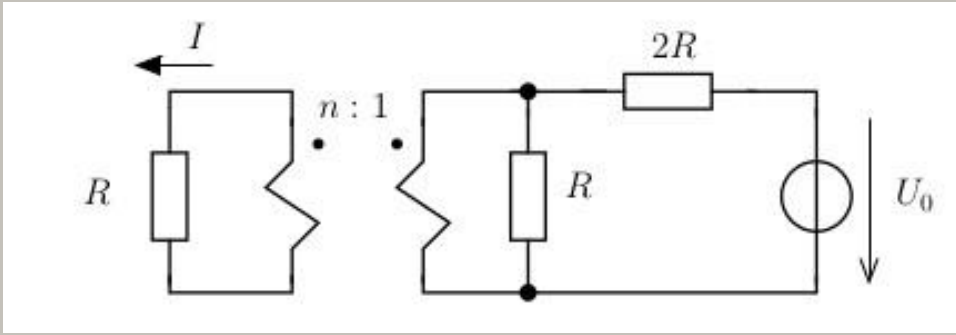
$$u_0 = r \cdot I_A$$

$$I_A = j_1 + j_2$$

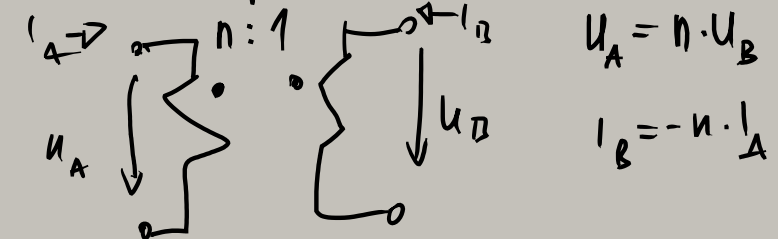
$$I_B = -j_2 + j_3$$

h.m.  
h.

hinyreepunkt



# Idealis transformator



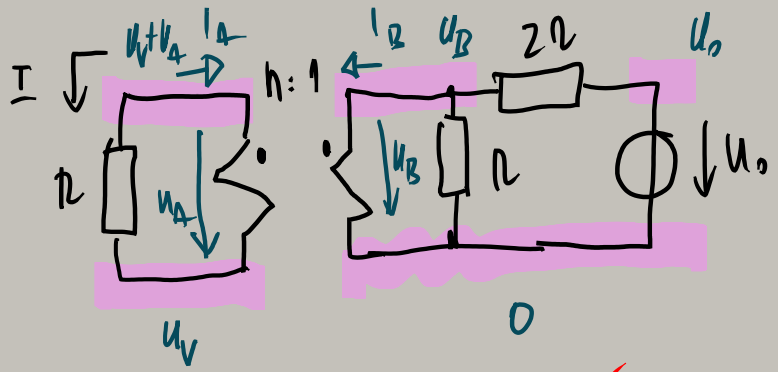
$$U_A = n \cdot U_B$$

$$I_B = -n \cdot I_A$$

nonenergibilas

$$U_A \cdot I_A + U_B \cdot I_B = U_A \cdot I_A + \frac{U_A}{n} \cdot (-n \cdot I_A) = 0$$

$$\underbrace{-U_A \cdot I_A}$$



$$I = -I_A$$

ismeretlen:  $U_A, U_B, I_A, I_B, U_A, I$

new to dy-  
most

$$I_A + \frac{U_A + U_A - U_A}{R} = 0$$

$$\frac{U_B - U_0}{2R} + \frac{U_B}{R} + I_B = 0$$

$$U_A = n \cdot U_B$$

$$I_B = -n \cdot I_A$$

$$\textcircled{1} U_A = -I_A \cdot R$$

$$3U_B + 2R I_B = U_0$$

$$U_A = n \cdot U_B$$

$$I_B = -n \cdot I_A$$

$$I = -I_A = \frac{U_0}{R} \cdot \frac{n}{3+2n^2}$$

$$3 \cdot \frac{1}{n} (-I_A \cdot R) + 2R \cdot (-n I_A) = U_0$$

$$(-I_A) \left( \frac{3R}{n} + n \cdot 2R \right) = U_0$$

$$I_A = \frac{-U_0}{\frac{3R}{n} + n \cdot 2R} = \frac{-U_0}{R} \cdot \frac{n}{3+2n^2}$$