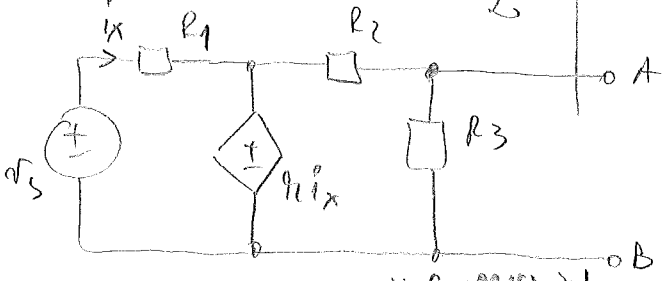
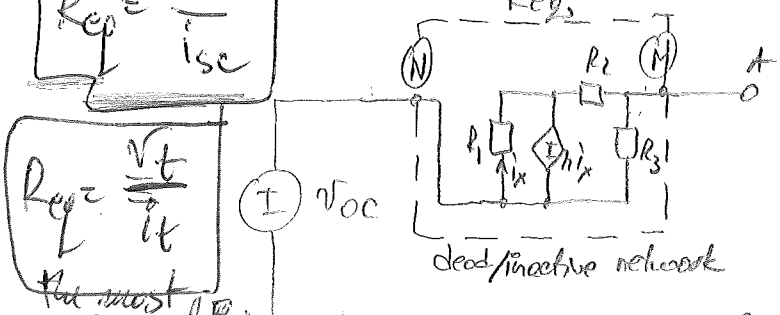
Example (Thevenin theorem)

General way to find out R_{eq}:

$$R_{eq} = \frac{V_{oc}}{i_{sc}}$$

$$R_{eq} = \frac{V_t}{i_t}$$ (the most general)



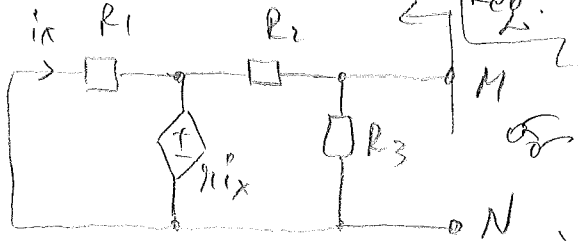


Suppress ind. voltage & curr. sources!

Do another example! 11)

(3) R_{eq}:

$$R_{eq} = \frac{V_{oc}}{i_{sc}}$$



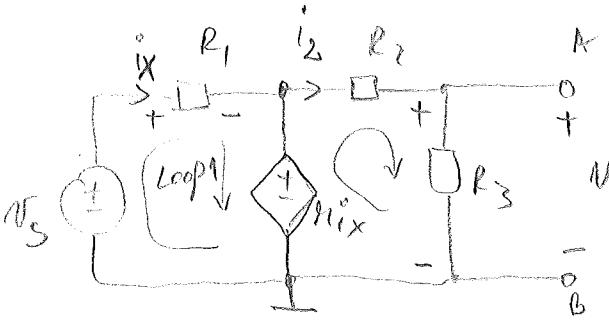
$R_{eq} = R_2 \| R_3$

$V_{oc} = \frac{R_3 \cdot r}{(R_1+R_3)(R_1+r)} \cdot v_s$

From eq. (1) & (2) $R_{eq} = \frac{V_{oc}}{i_{sc}} = \frac{\frac{R_3 r}{(R_1+R_3)(R_1+r)} \cdot v_s}{\frac{r}{R_2(R_1+r)} \cdot v_s} = \frac{R_2 R_3}{R_2+R_3} = R_2 \| R_3$

$$R_{eq} = R_2 \| R_3 \quad (3)$$

(1) V_{oc}



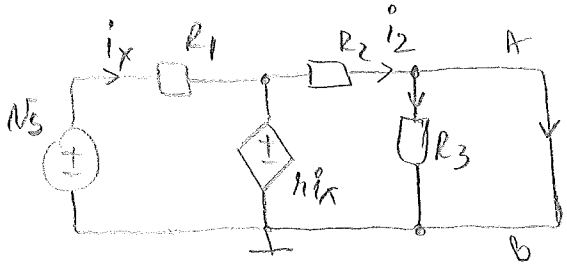
$$V_{oc} = \frac{R_3}{R_2+R_3} \cdot r \underbrace{i_x}_{=?}$$

↑ voltage division.

KVL Loop 1: $v_s = R_1 i_x + r i_x \Rightarrow i_x = \frac{1}{R_1+r} \cdot v_s$

$$\Rightarrow V_{oc} = \frac{R_3 \cdot r}{(R_2+R_3)(R_1+r)} \cdot v_s \quad (1)$$

(2) i_{sc}



$$i_{sc} = i_2 = \frac{r i_x}{R_2} = \frac{r}{R_2} \cdot \frac{1}{R_1+r} \cdot v_s = i_{sc} \quad (2)$$