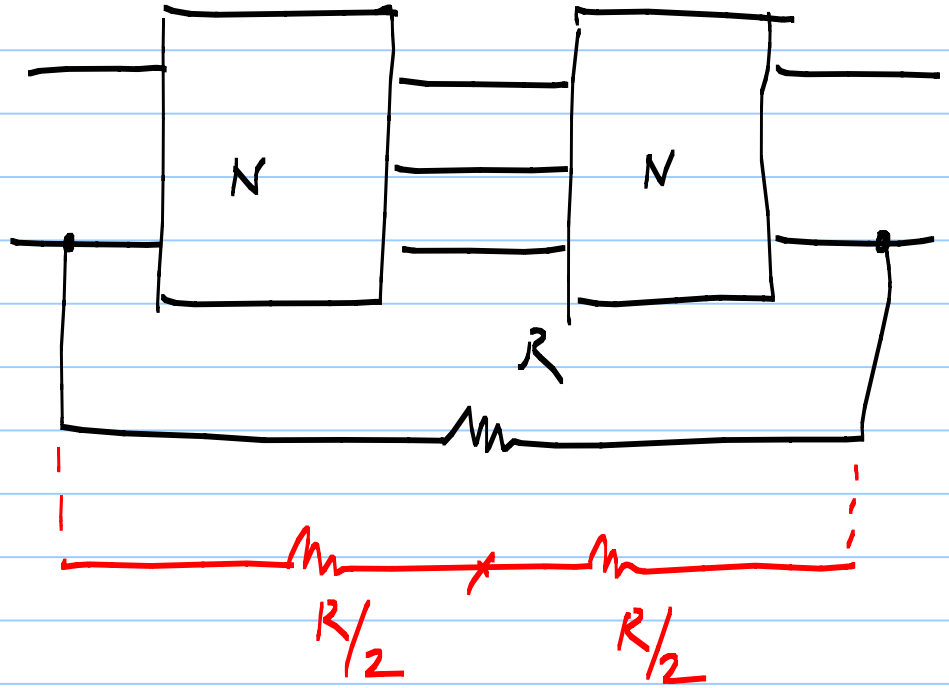
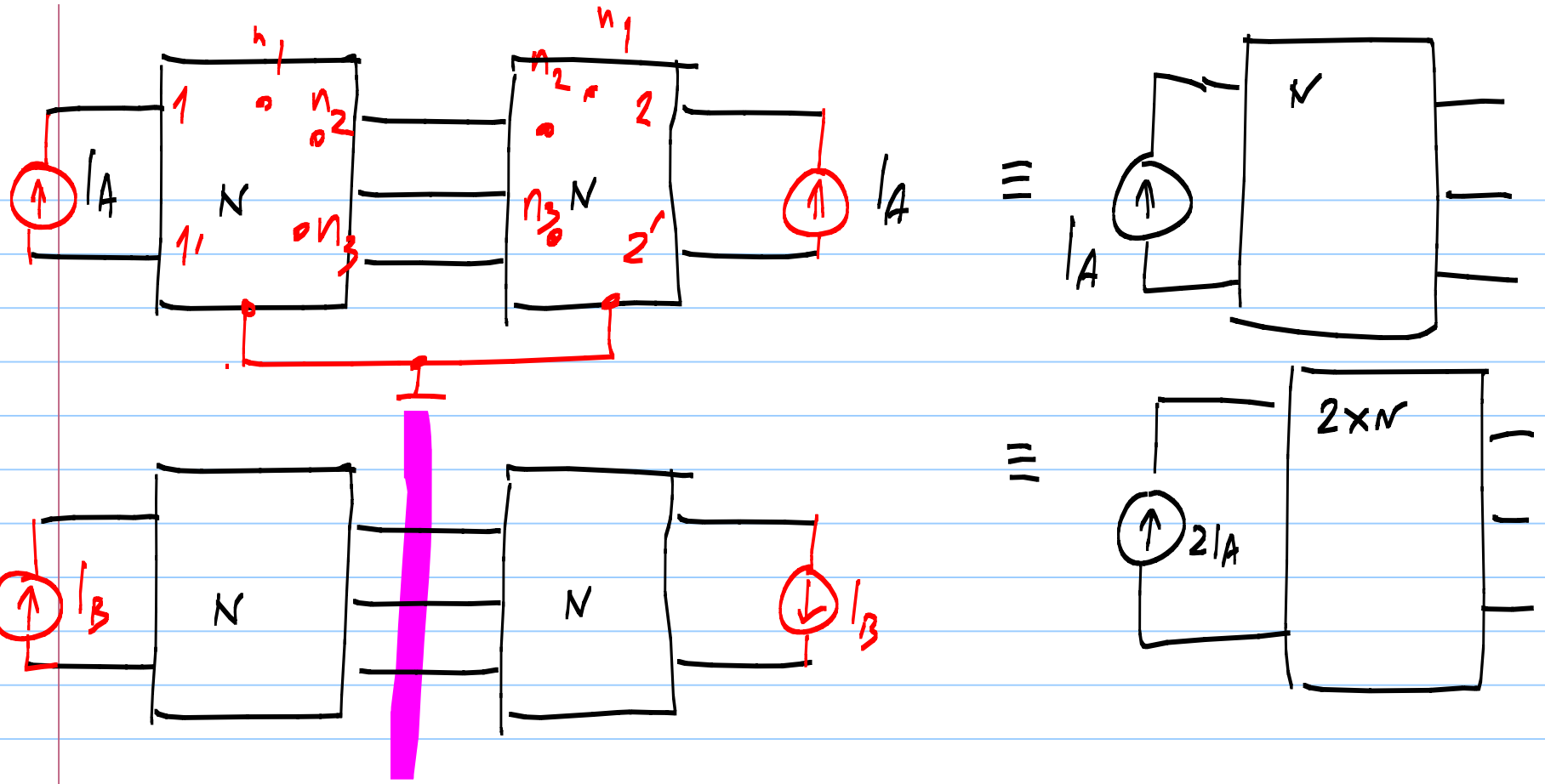
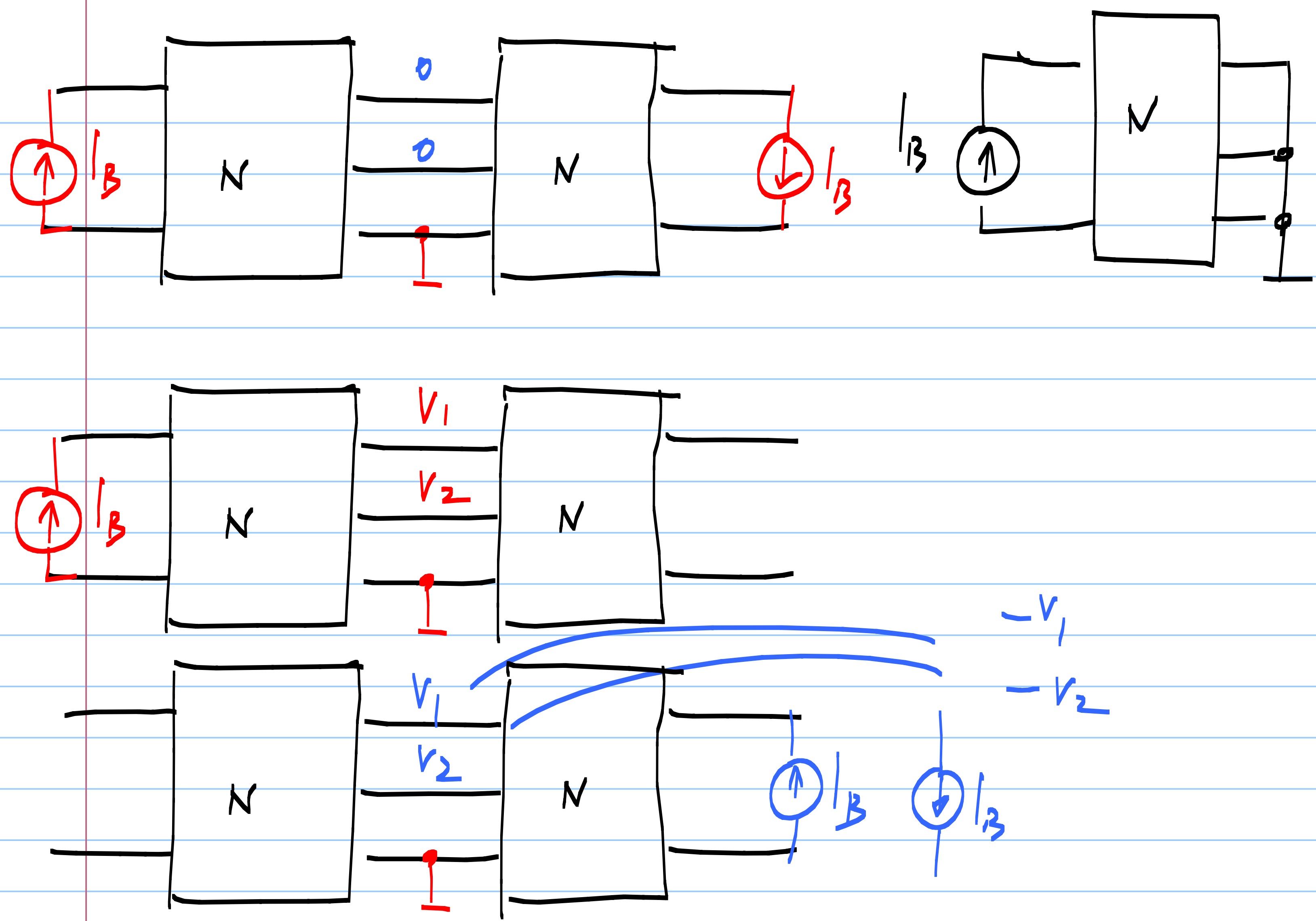
Lecture 13

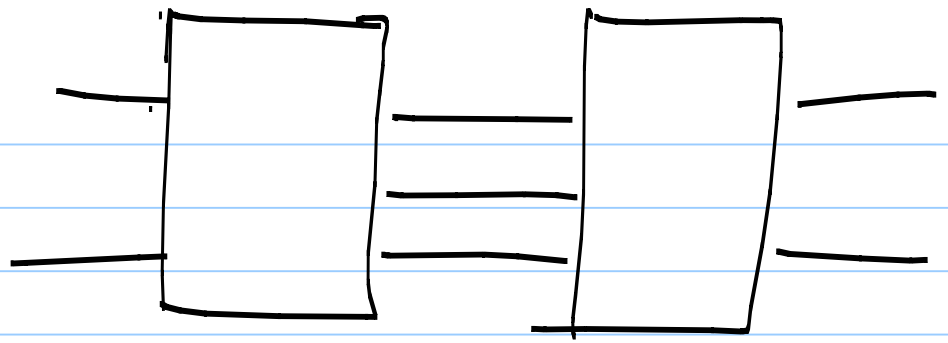
Symmetric circuits




n1
n2
n3
1
1'
2
2'
N
N
N
N
IA
IA
IB
IB
≡
N
IA
≡
2xN
2IA



I_B
N
0
0
N
I_B
I_3
N
V_1
V_2
$-V_1$
$-V_2$
I_3



(2A, 1A)

(4A, 2A)

$\{ I_1$

$\{ 0$

$0 \}$

$I_1 \}$

> linearly combine

$\{ I_A$

$\{ I_B$

Even mode

Common mode

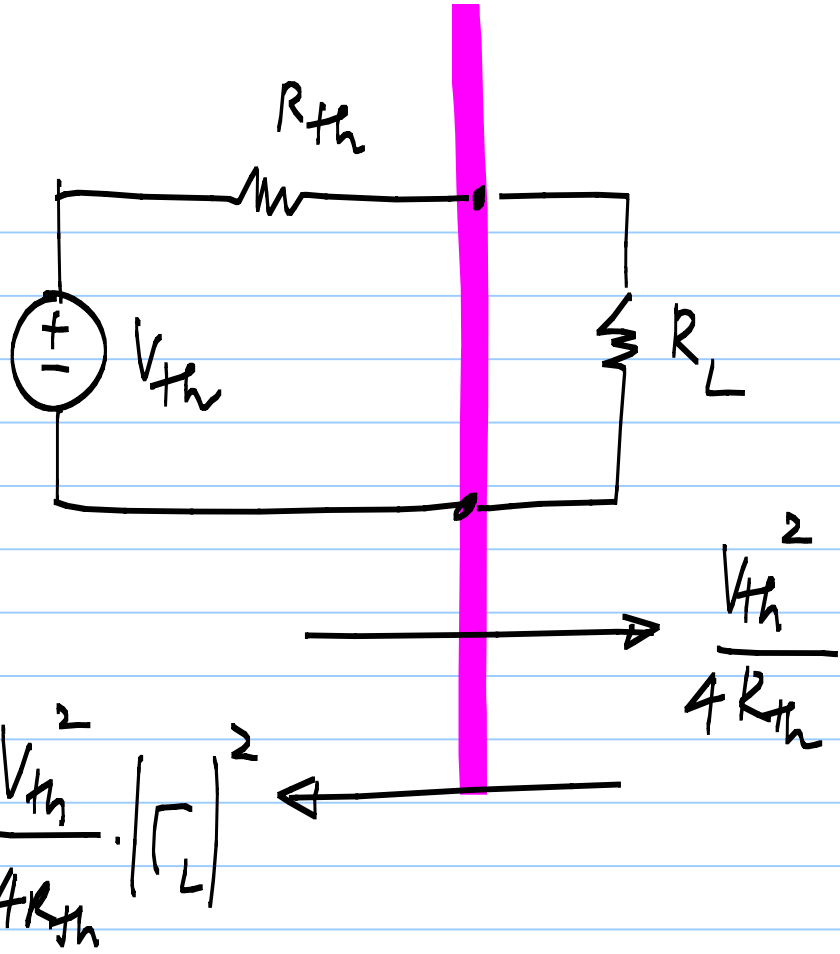
Odd mode

Differential

$I_A \}$

$- I_B \}$

> linearly combine

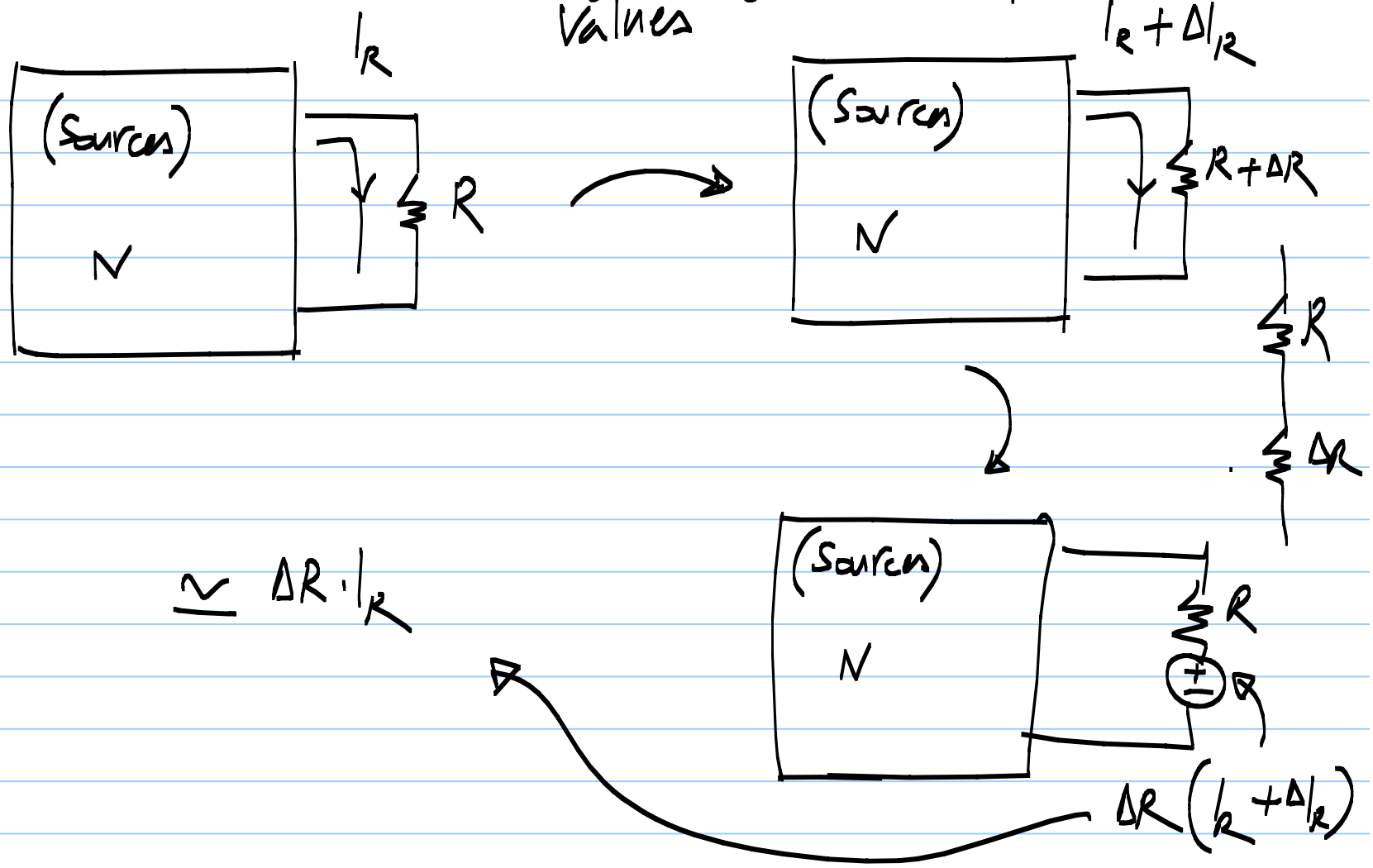


$$\left(\frac{V_{Th}}{R_{Th}+R_L}\right)^2 \cdot R_L$$

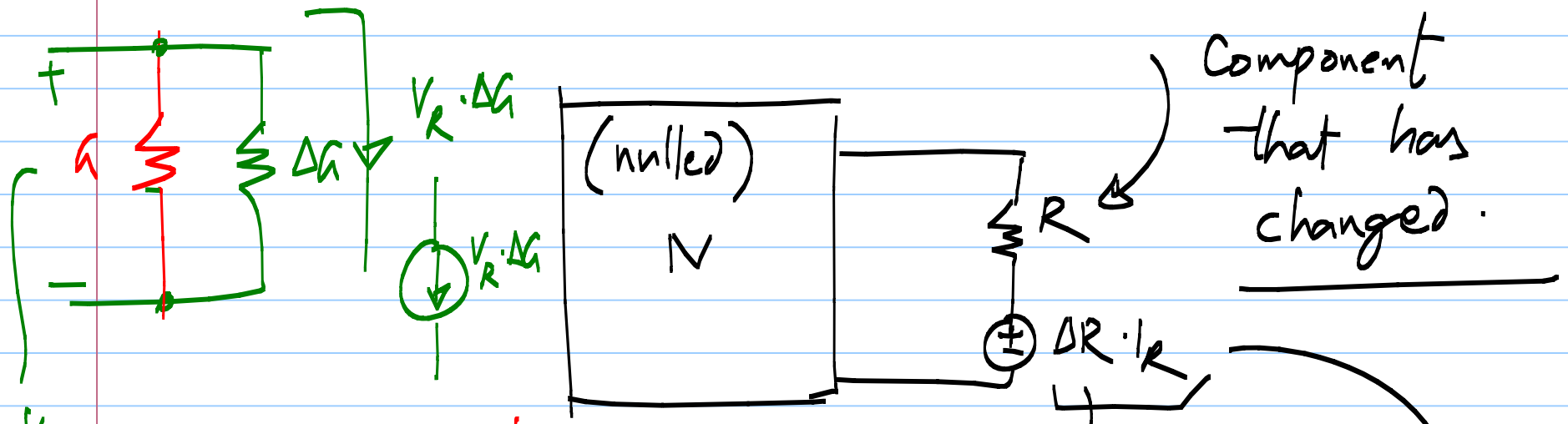
$$\frac{V_{Th}^2}{4R_{Th}}\left(1-|\Gamma_L|^2\right)$$

$$|\Gamma_L| = \left|\frac{R_L - R_{Th}}{R_L + R_{Th}}\right|$$

Effect of change in component values



Changes due to the resistance change



Compensation theorem

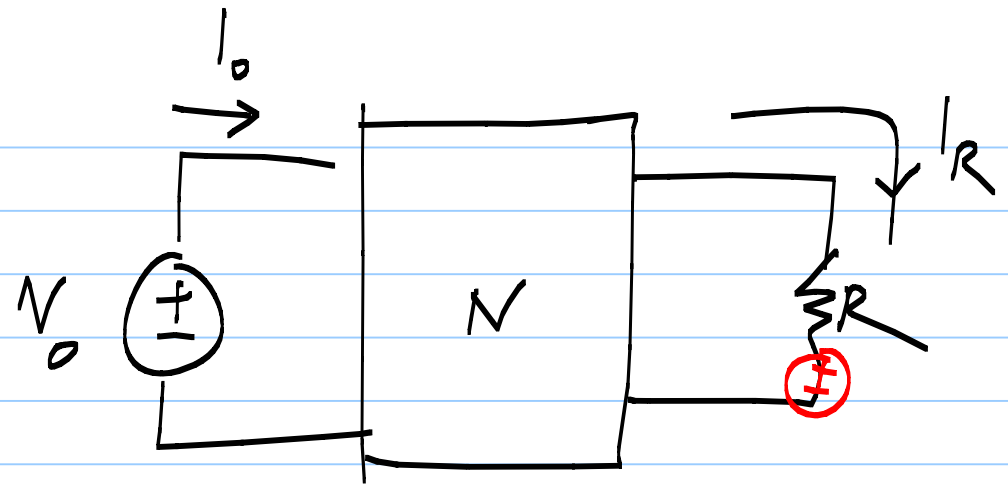
$$\Delta G = -\frac{\Delta R}{R^2}$$

$R \rightarrow R + \Delta R$

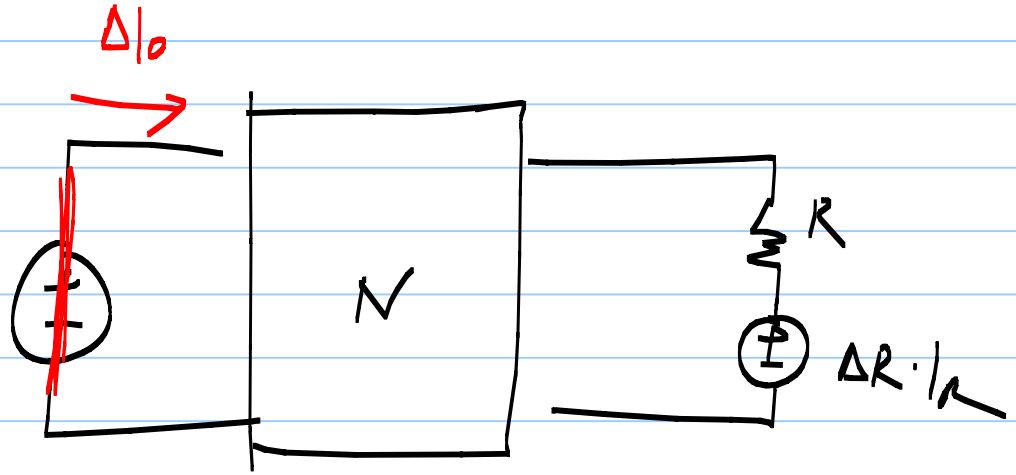
$$\frac{1}{R} = \frac{1}{R + \Delta R}$$

Change in R × Original current

$$\frac{1}{R}\left(1 - \frac{\Delta R}{R}\right)$$



$$\frac{I_R}{V_0} = \frac{-\Delta I_0}{\Delta R \cdot I_R}$$



Circuit Theorems:

* Pushing a voltage source through a node
* Splitting a current source
* Tellegen's theorem – Circuit graph
* Thevenin / Norton theorems
* Reciprocity theorem
* Compensation theorem
* Substitution theorem