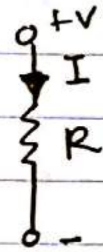
02/25

$\text{Power} \equiv \frac{\text{Energy}}{\text{time}}$

Power (dissipated) $= V \cdot I$ when V, I are (+)



Power = VI

$V = IR$

substituting,

$\text{Power} = IR \cdot I$

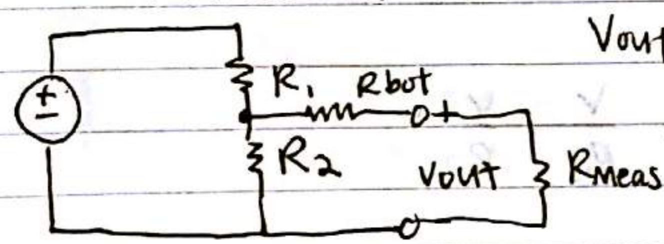
$= I^2R.$

$\text{Power} = V \cdot \frac{V}{R}$

$= \frac{V^2}{R}.$

Equivalence

Recall touchscreen:



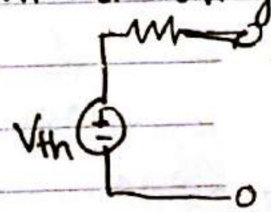
$V_{out} = \frac{R_2}{R_1+R_2} .5V$ "volltage divider"

$= \frac{L_2}{L_{TOT}} \cdot 5V$

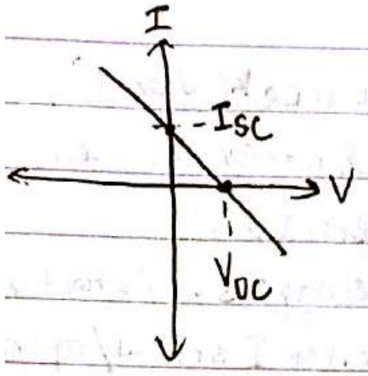
- bad, because circuit is no closed w/ Rmeas.

Thevenin's Theorem:

· A circuit made up of "linear" components, can be replaced with a voltage source and resistor.

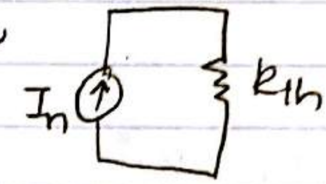


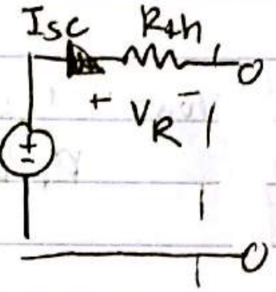
(i.e. any circuit can be reduced to a dimension of 2)



because the component is linear, it can be represented as a line.

Norton: A circuit can be reduced to current source + resistor.





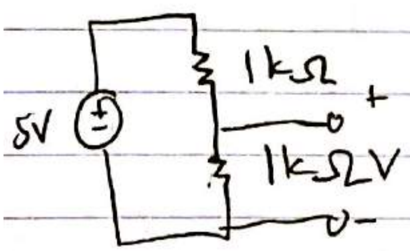
$V_{th} = V_{oc}$.

$R_{th} = \dfrac{V_{th}}{I_{sc}}$

$V_R = V_{th}$

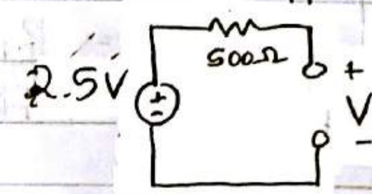
$I = V/R$

$\rightarrow I_{sc} = V_{th}/R_{th}$.



$\Rightarrow$

Thevenin equivalent:



$V_{oc} = 2.5V$

$I_{sc} = 0.005A$.

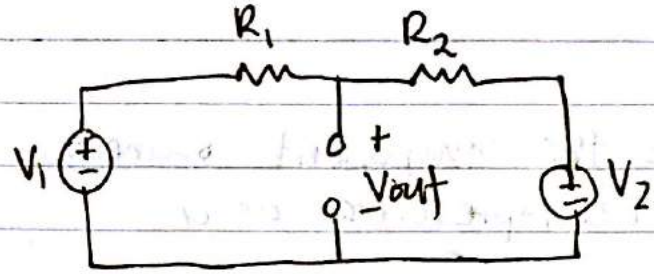
$R_{th} = \dfrac{V_{th}}{I_{sc}} = 500\,\Omega$

Superposition

$y = ax_{\cancel{2}}\ x_1 + x_2$

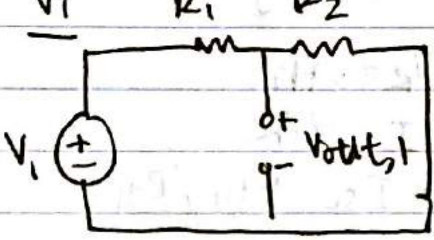
$y = a(x_1 + x_2)$

$= \underline{ax_1 + ax_2}$



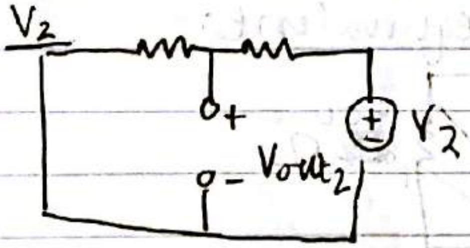
For each source k (V or I),
* take all other sources, set them to 0.
(replace other Vsrc w/ short)
(replace other I-src w/ open)
→ compute $V_{out,k}$ due to that source (k)
* sum up $V_{out,k}$ for all k.

V_1



$$V_{out_1} = \frac{R_2}{R_1+R_2} \cdot V_1$$

V_2

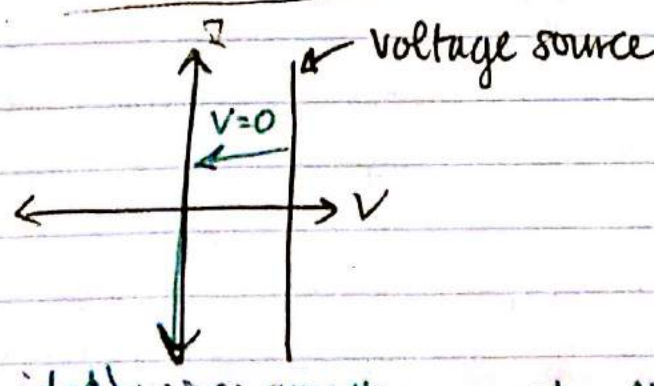


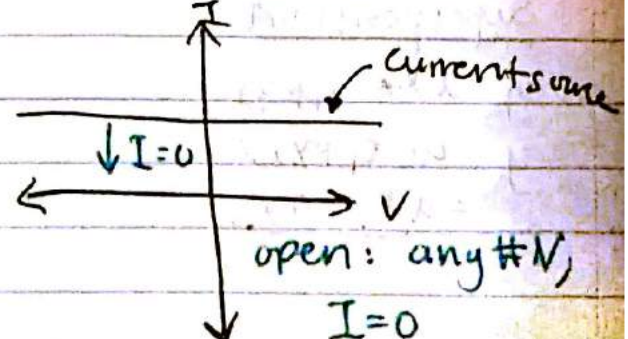
$$V_{out_2} = \frac{R_1}{R_1+R_2} V_2$$

$$V_{out} = \frac{R_1 V_2 + R_2 V_1}{R_1 + R_2}$$

If $R_1 = R_2$,

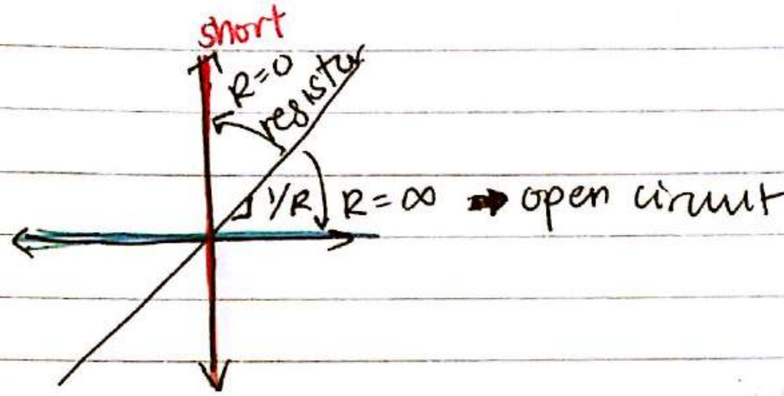
$$V_{out} = \frac{V_1 + V_2}{2}$$





open: any # V, I=0

ideal wire: any # current, $\Delta V = 0$


short
R=0
register
1/R
R=∞ → open circuit