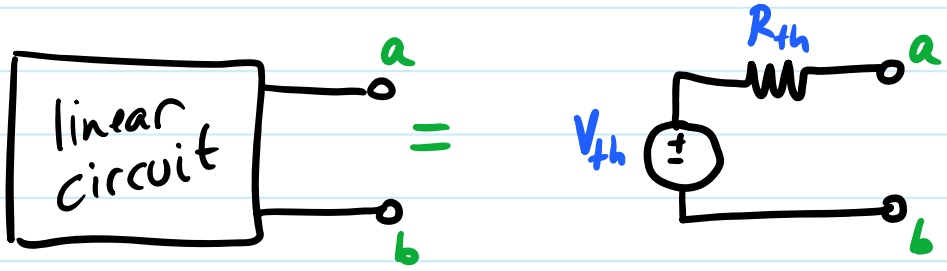
# Thevenin / Norton Equivalent Circuits and Source Transformation

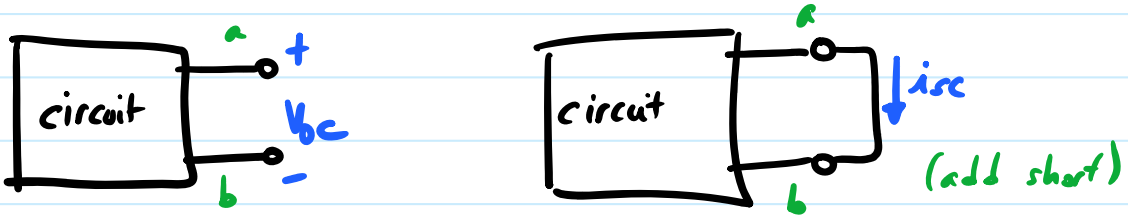
Wednesday, February 1, 2017 12:30 PM

## (I.) Thevenin equivalent circuits




### (a.) There are three methods to find $V_{th}$ and $R_{th}$.

i) Find $V_{oc}$ (open circuit voltage) and $i_{sc}$ (short circuit current).

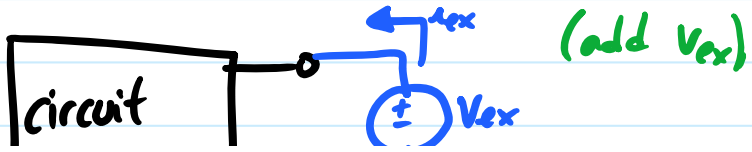


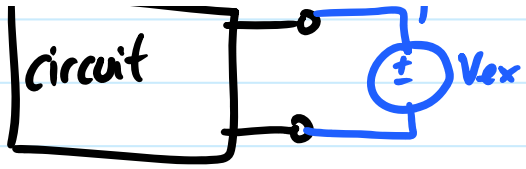

then, $V_{th} = V_{oc}$ and $R_{th} = \frac{V_{oc}}{i_{sc}}$

### (b.) Find either $V_{oc}$ and $i_{sc}$ as above (whichever is easier).

Then, deactivate all independent sources (i.e. set them to 0). Then, simplify circuit to find the equivalent resistance. This is $R_{th}$. (This method only works if there are no dependent sources in circuit).

### (c.)



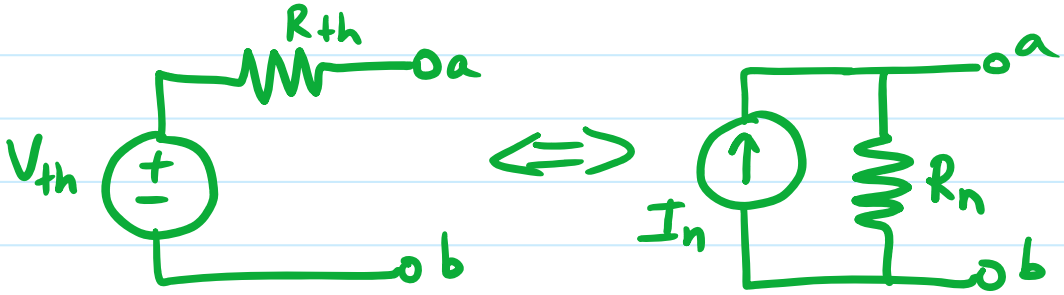



Add a fictitious $V_{ex}$ as above.
Solve for $i_{ex}$.
$R_{th} = \frac{V_{ex}}{i_{ex}}$

$V_{oc}$ or $i_{sc}$ can be solved as above.

## II. Source transformations

If a circuit can be represented by a voltage source and a resistor, it stands to reason that it should also be similarly represented by a current source and a resistor.




$$I_n = I_{th}$$

$$I_n = \frac{V_{th}}{R_{th}}$$