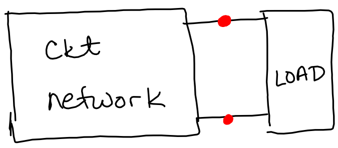
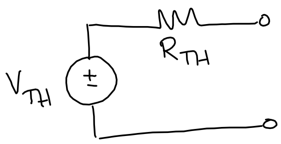
Equivalent Ckts

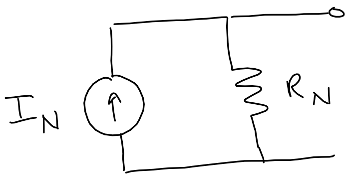


create equivalent ckt => 2 elements

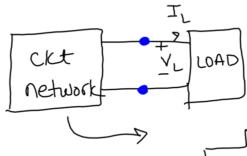
Thevenin Eq. Ckt



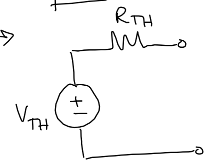
Norton Eq. Ckt



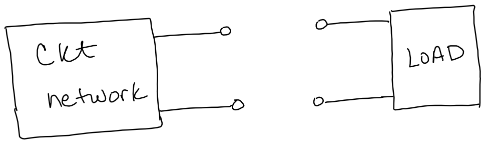
Thevenin Eq. Ckt Steps



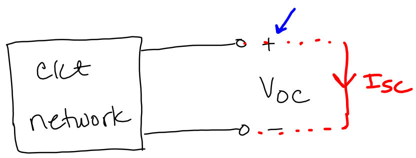
① Identify ckt network | load.



② Separate the ckt network from the load.



③ a) Find the $V_{TH} = V_{OC}$



Solve for V_{OC} using any method that you like.

$$V_{TH} = V_{OC}$$

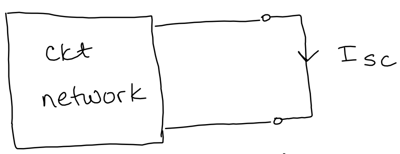
b) Find R_{TH}

1. Quick method. May be used iff the ckt network contains zero dependent sources.

- turn off all sources (à la superposition)
- left with a network of resistors which may be simplified to a single resistor. (R_{eq})
- $R_{TH} = R_{eq}$

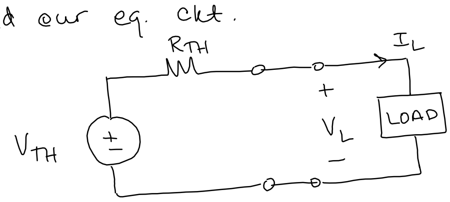
2. Long method: may be used for any ckt network.

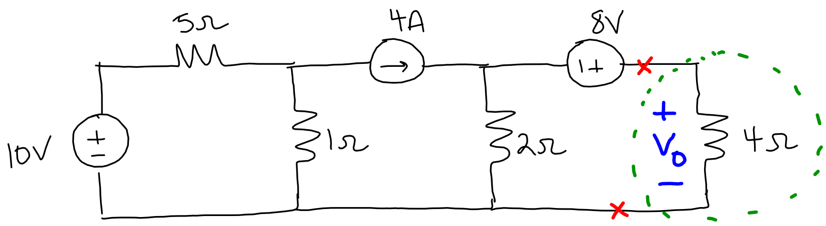
$$R_{TH} = \frac{V_{OC}}{I_{SC}}$$



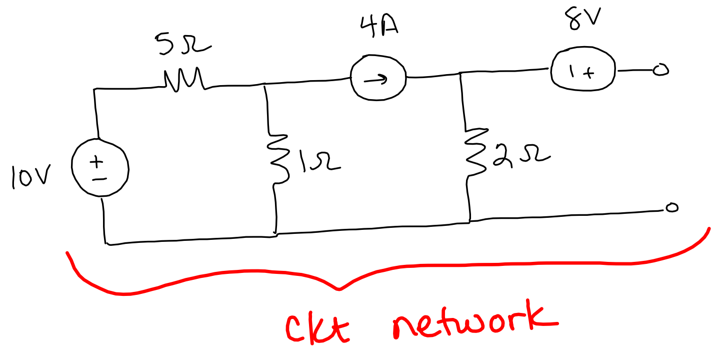
Solve for I_{SC} using any method you like

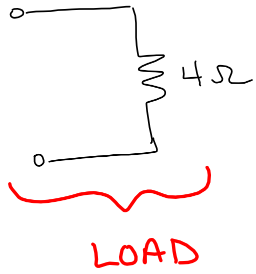
④ Build our eq. ckt.



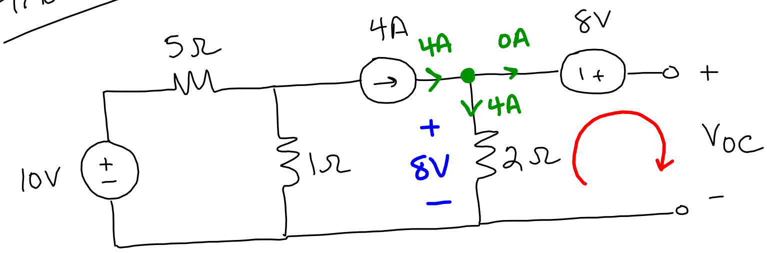


Find V_o using a Thev. Eq. Ckt.





Find V_{TH}



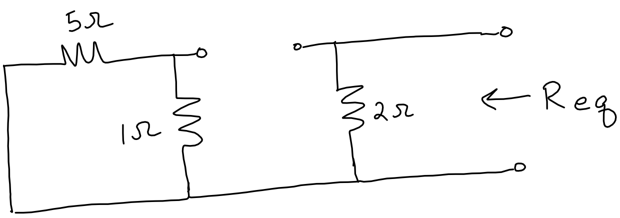
by KVL

$$8 + 8 - V_{OC} = 0$$

$$V_{OC} = 16V$$

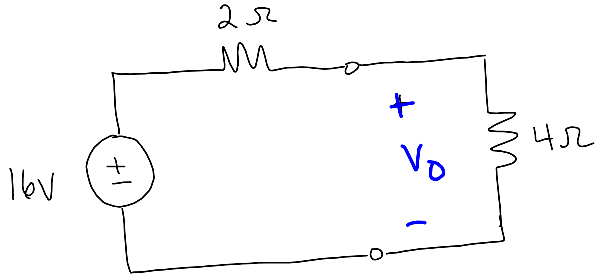
$$\boxed{V_{TH} = 16V}$$

Find R_{TH}



$$R_{eq} = 2\Omega$$

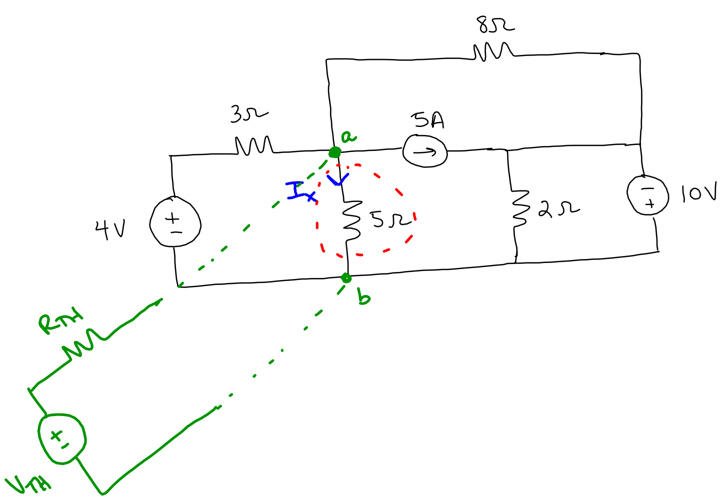
$$\boxed{R_{TH} = 2\Omega}$$

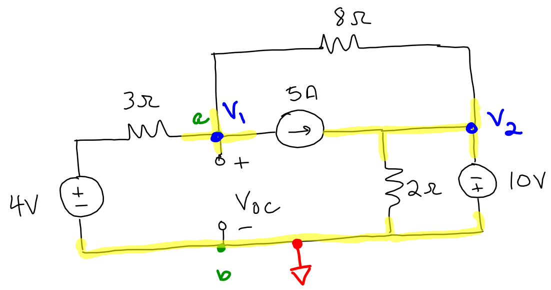


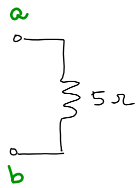
$$V_o = 16\left(\frac{4}{6}\right)$$

$$\boxed{V_o = 10.67V}$$

Find I_x using Thev. Eq. ckt.







Know

$V_2 = -10V$

$V_1 = V_{oc}$

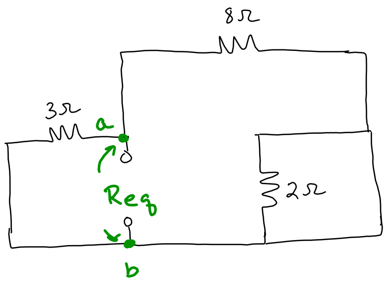
nodal

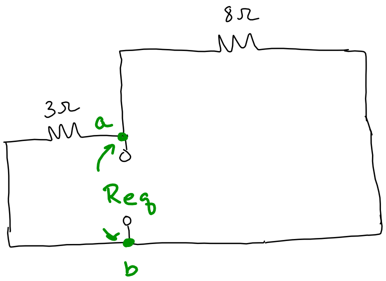
$$\frac{V_1 - 4}{3} + \frac{V_1 - \cancel{V_2}^{-10}}{8} + 5 = 0$$

$V_1 = -10.72V$

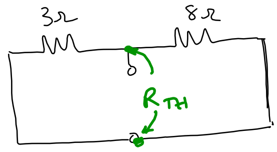
$$\boxed{V_{oc} = -10.72V}$$

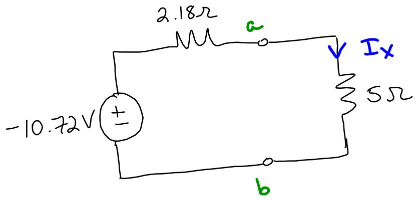
Find R_{TH}





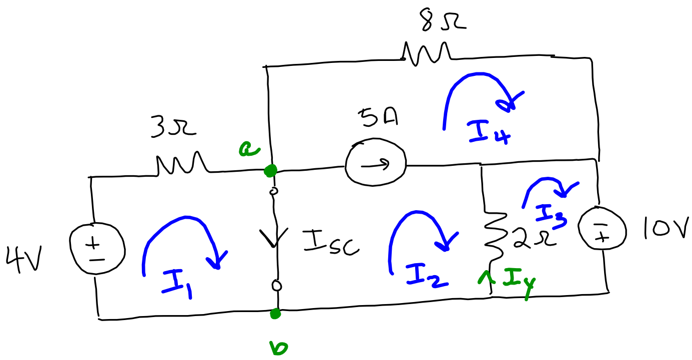
$R_{eq} = 3 || 8 = 2.18\,\Omega$





$$I_x = \frac{-10.72}{2.18 + 5}$$

$I_x = -1.44A$



Know

$I_{sc} = I_1 - I_2$

$$\boxed{I_2 - I_4 = 5A}$$

$I_1 = \frac{4}{3} = 1.33\,A$

$I_y = \frac{10}{2} = 5A$

$$\boxed{I_3 - I_2 = 5}$$