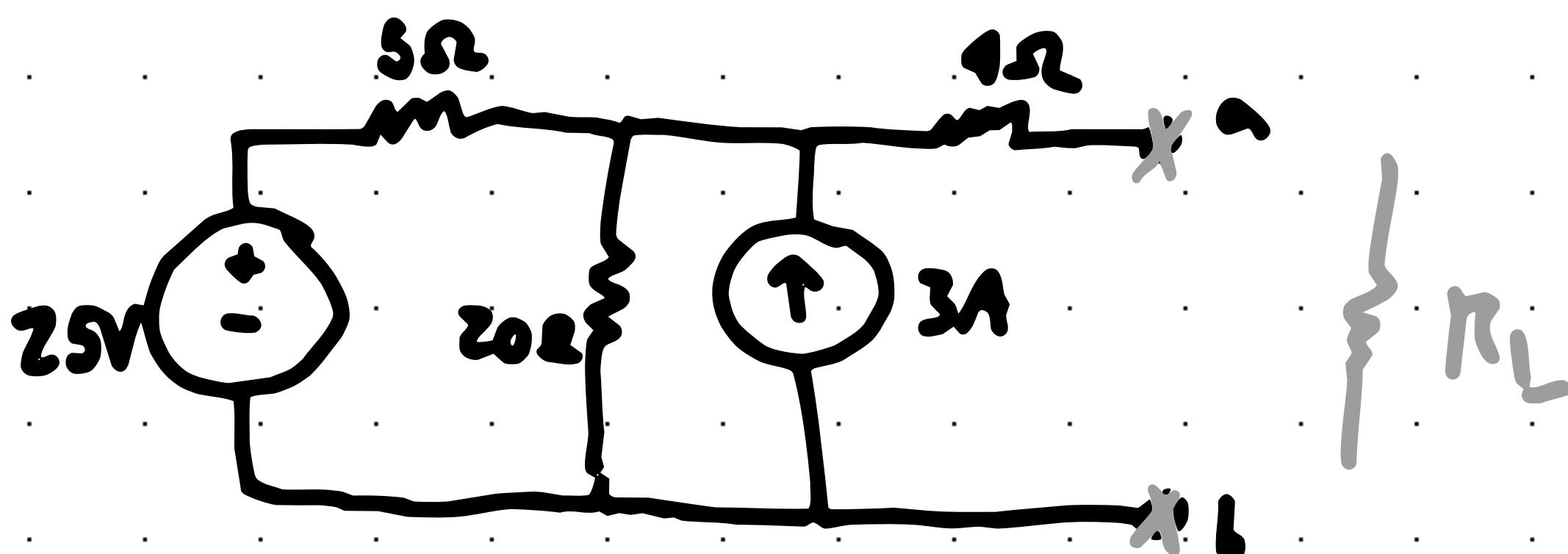


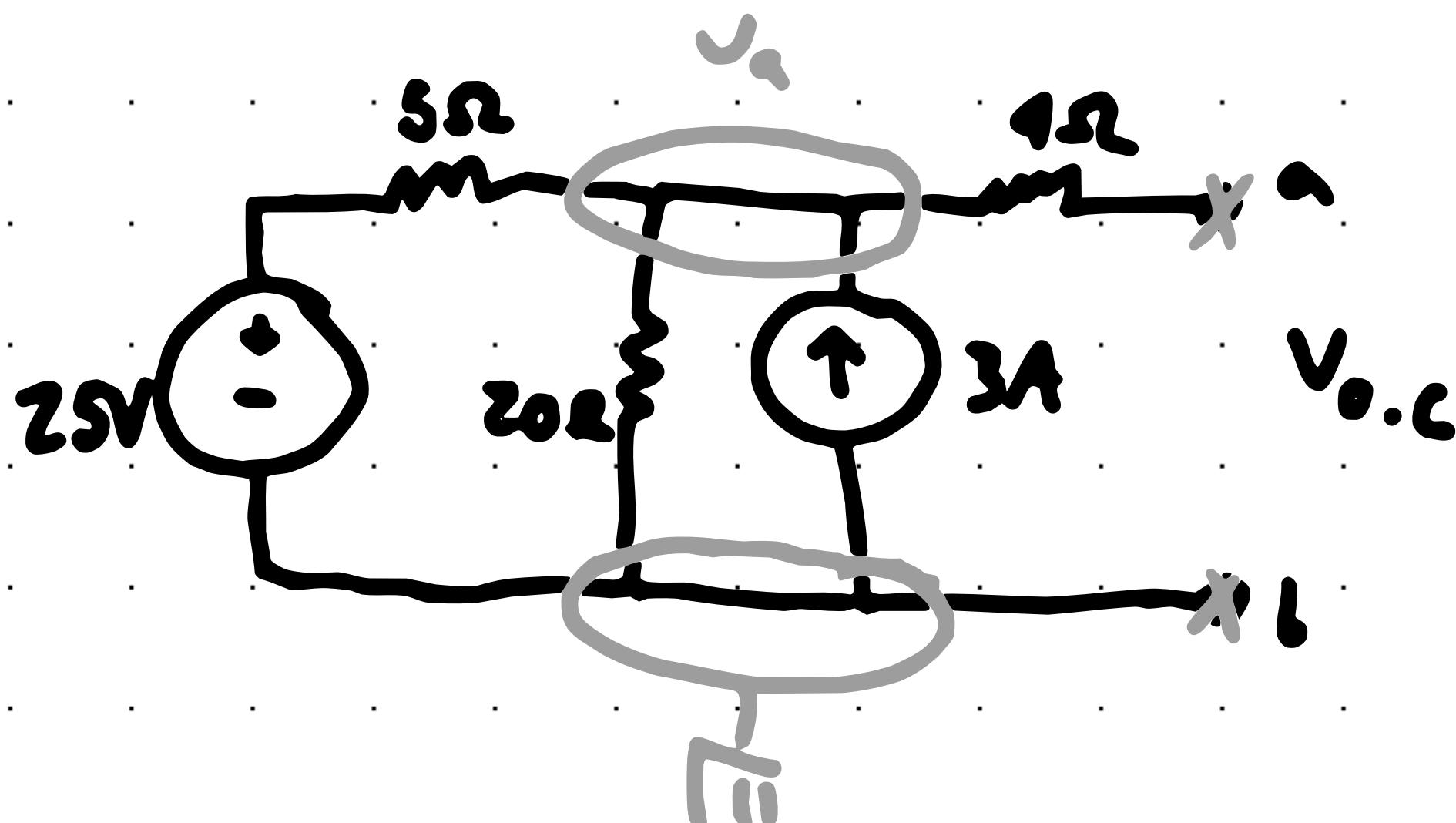
Thevenin and Norton's equivalents Problem

Ex: Find Thevenin and Norton's equivalent between a and b for the following circuit



Calculate the value of R_L for max power and max power

Solve V_{th}

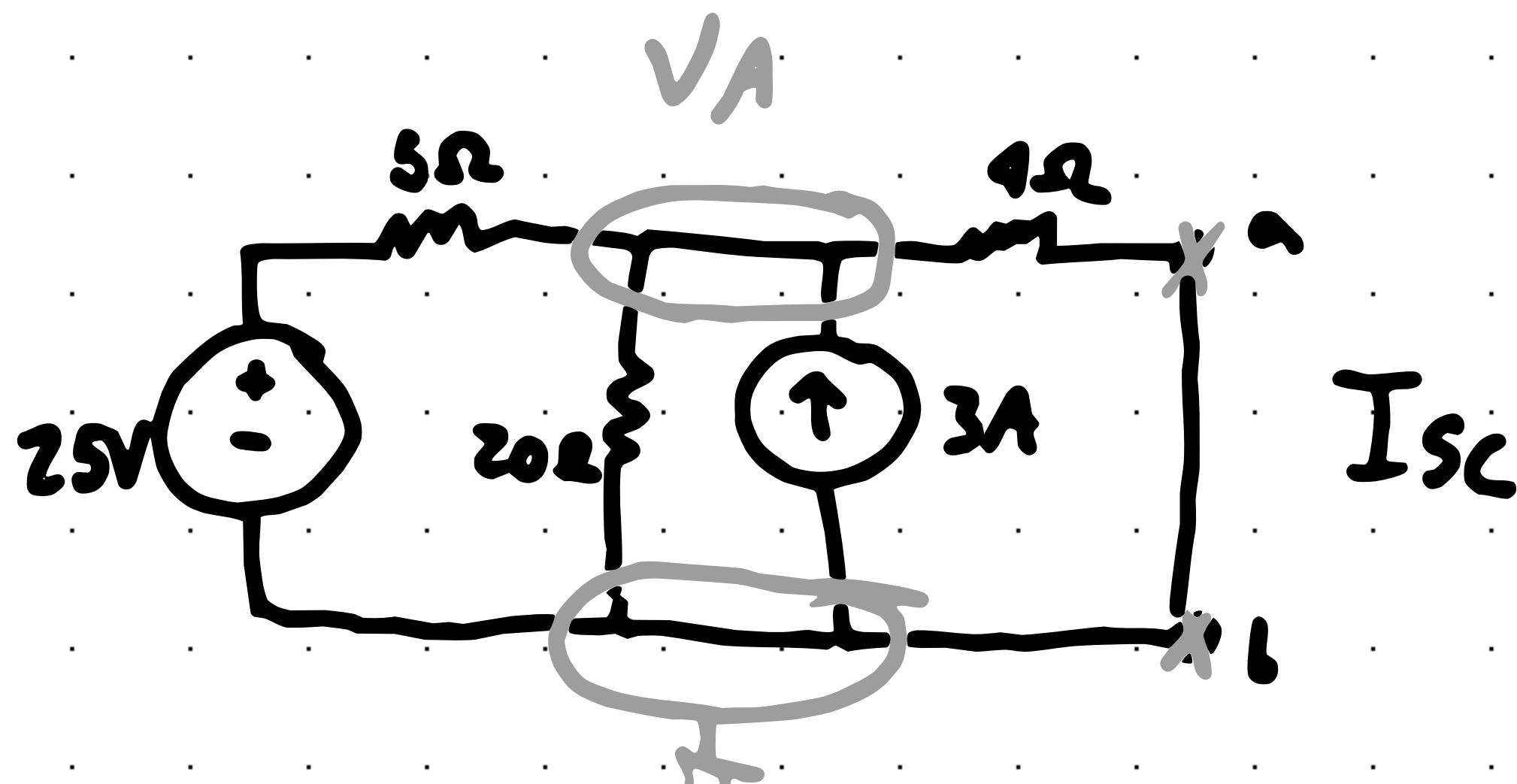


$$\frac{V_a - 25}{5} + \frac{V_o.c}{20} - 3 = 0$$

$$V_a = 32 \text{ V}$$

$$V_{o.c} = V_a = V_{TH} = 32 \text{ V}$$

To Calculate I_N



$$I_{SC} = \frac{V_A}{4}$$

$$\frac{V_A - 25}{5} + \frac{V_A}{2} + (-3) + \frac{V_A}{4} = 0 \quad V_A = 16V$$

$$I_{SC} = \frac{16}{4} = 4A$$

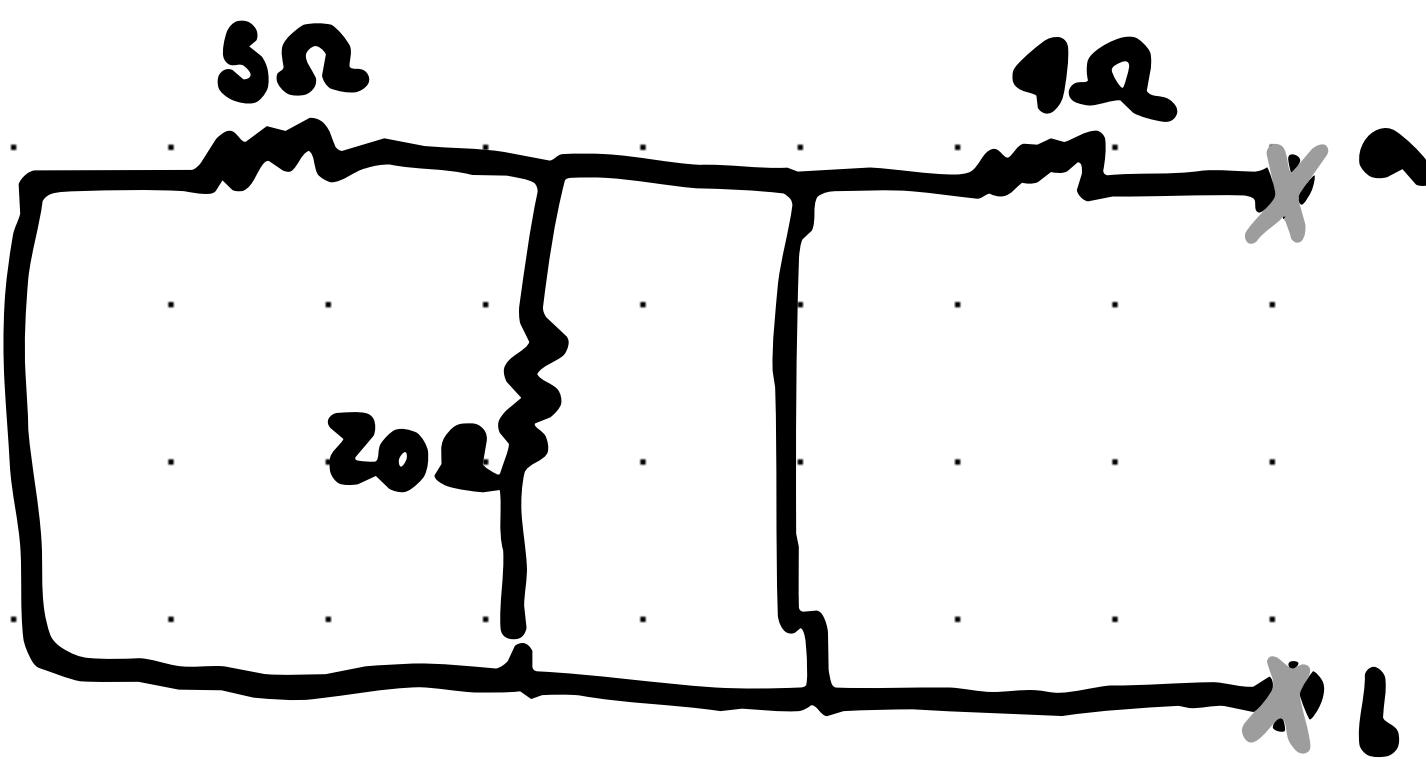
$$I_N = I_{SC} = 4A$$

Calculating R_{TH}

$$R_{TH} = \frac{V_{TH}}{I_N} = \frac{32}{4} = 8\Omega$$

Another Method for R_{TH}

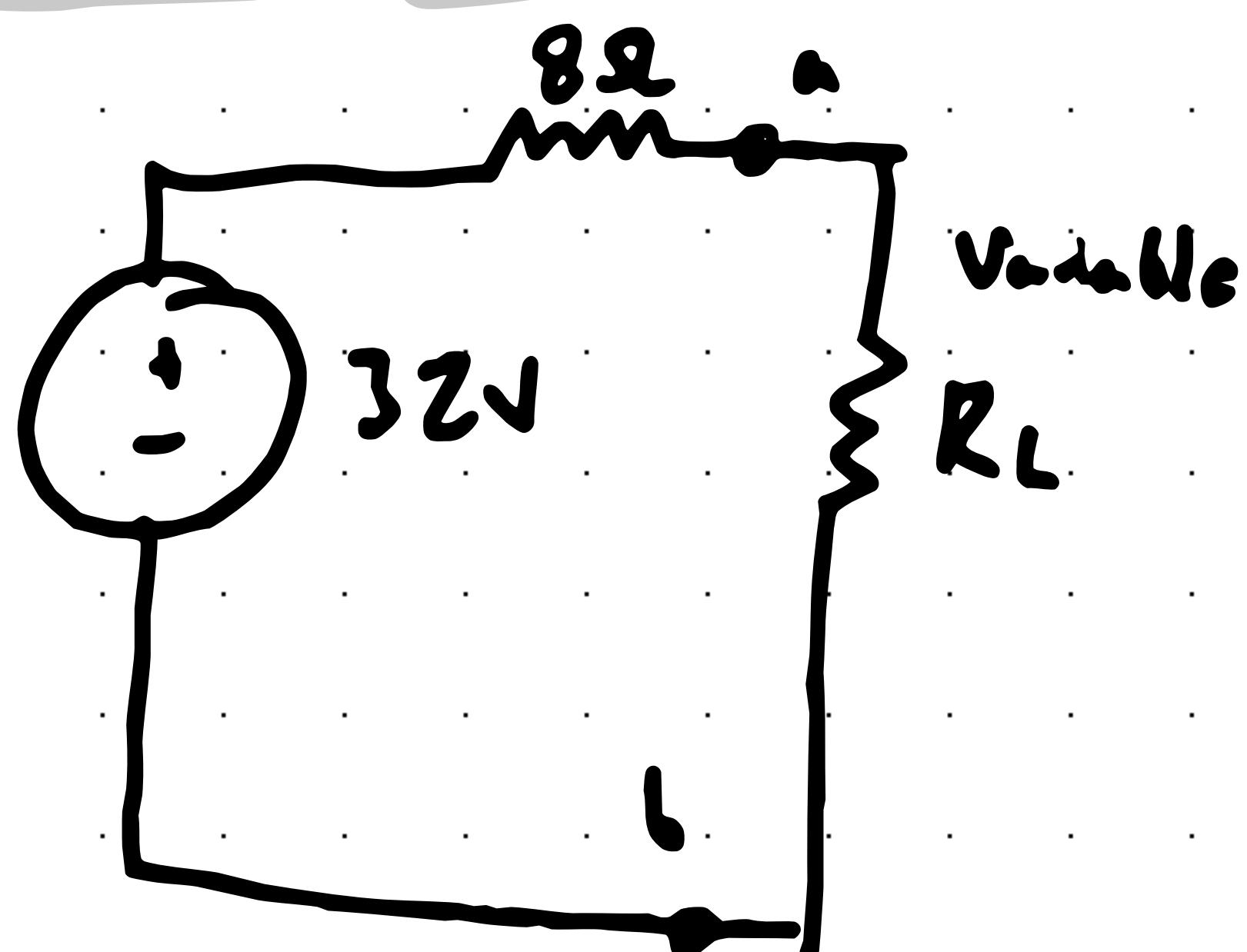
Reins
Independent
Sources



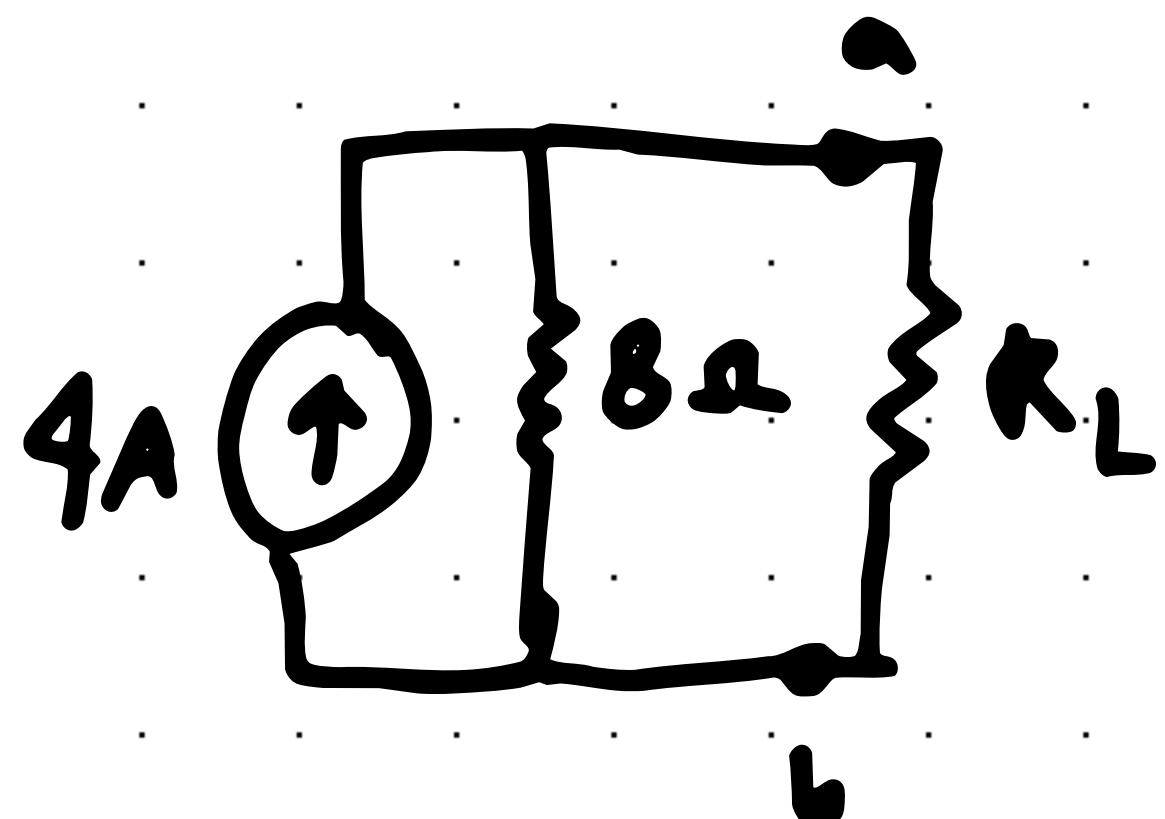
$$R_{eq} = 5/120 + 4$$

$$R_{eq} = 8 \Omega$$

Taylor's Equivalent



Norton Equivalent

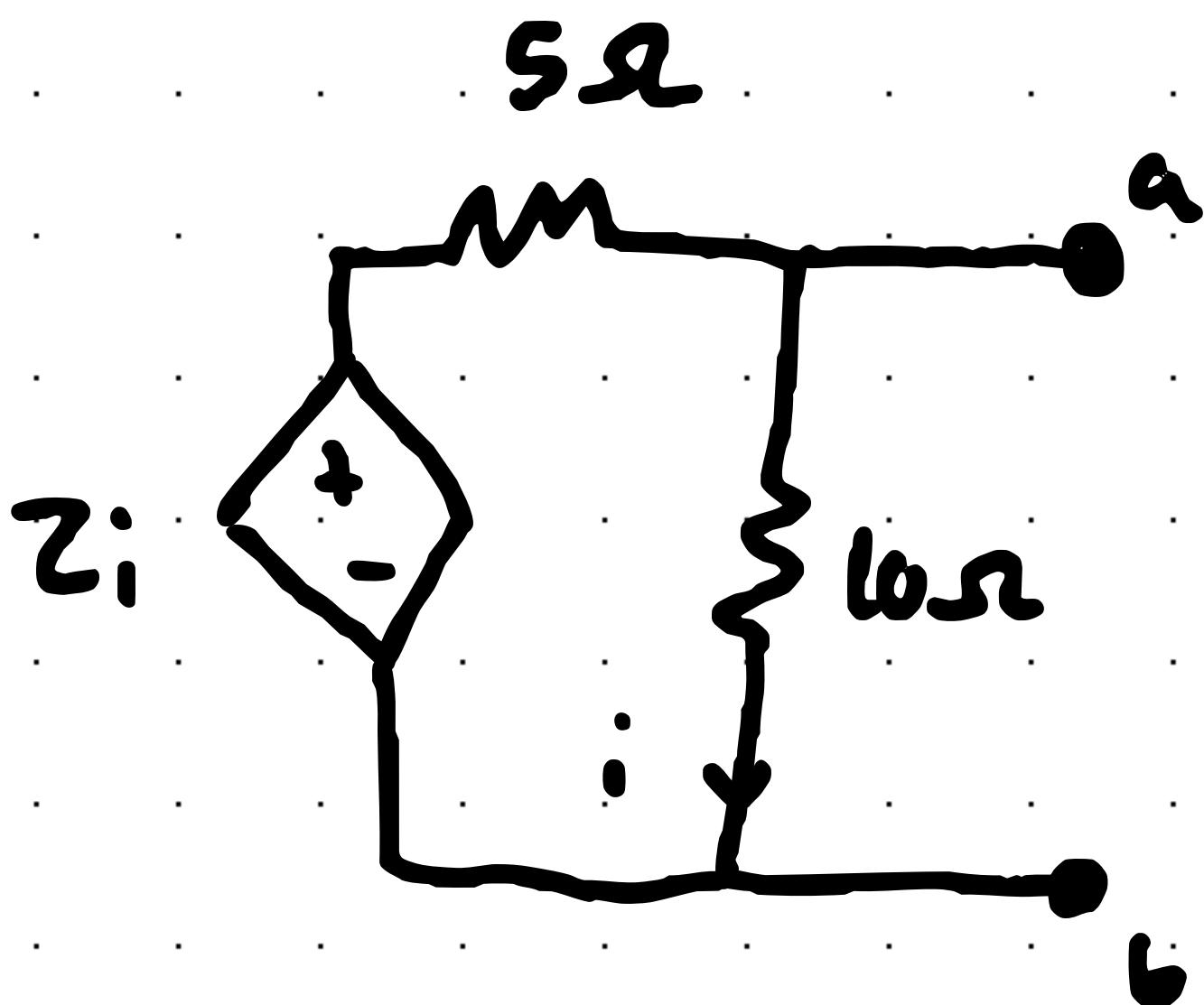


for Max Power

$$R_L = R_{TH} = 8 \Omega$$

$$P_{RL} = I^2 R = \left(\frac{3}{8+8} \right)^2 8 \text{ Watts}$$

Example 2 Find Thevenin and Norton equivalents between a and b.



SOL

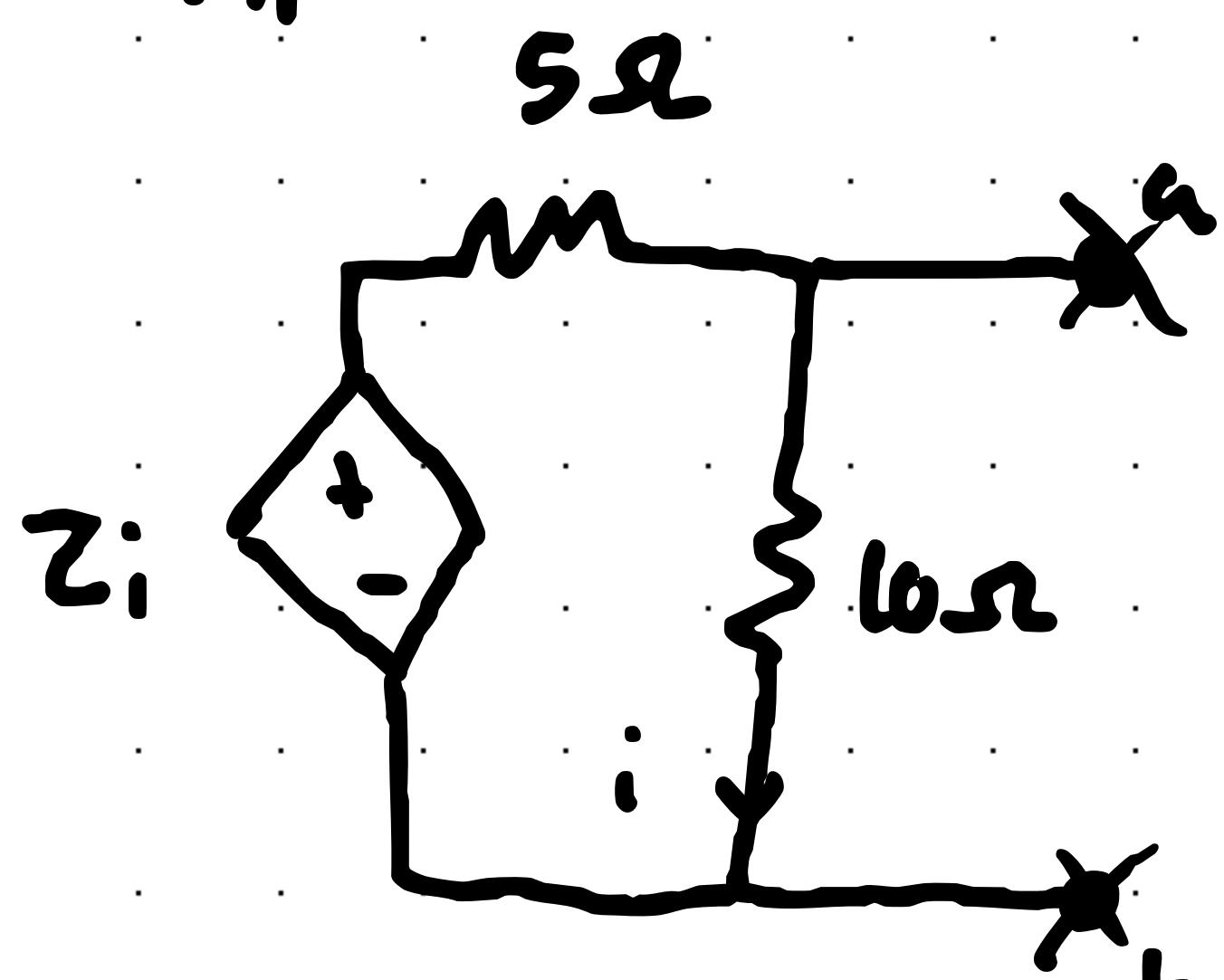
To Calculate V_{TH}

$$V_{OC} = 10i$$

$$\sum V = 0 \quad Z_i - 5i - 10i = 0$$

work ①

$$-13i = 0$$



i = 0?

What?
How does this
affect Z_{TH} ?

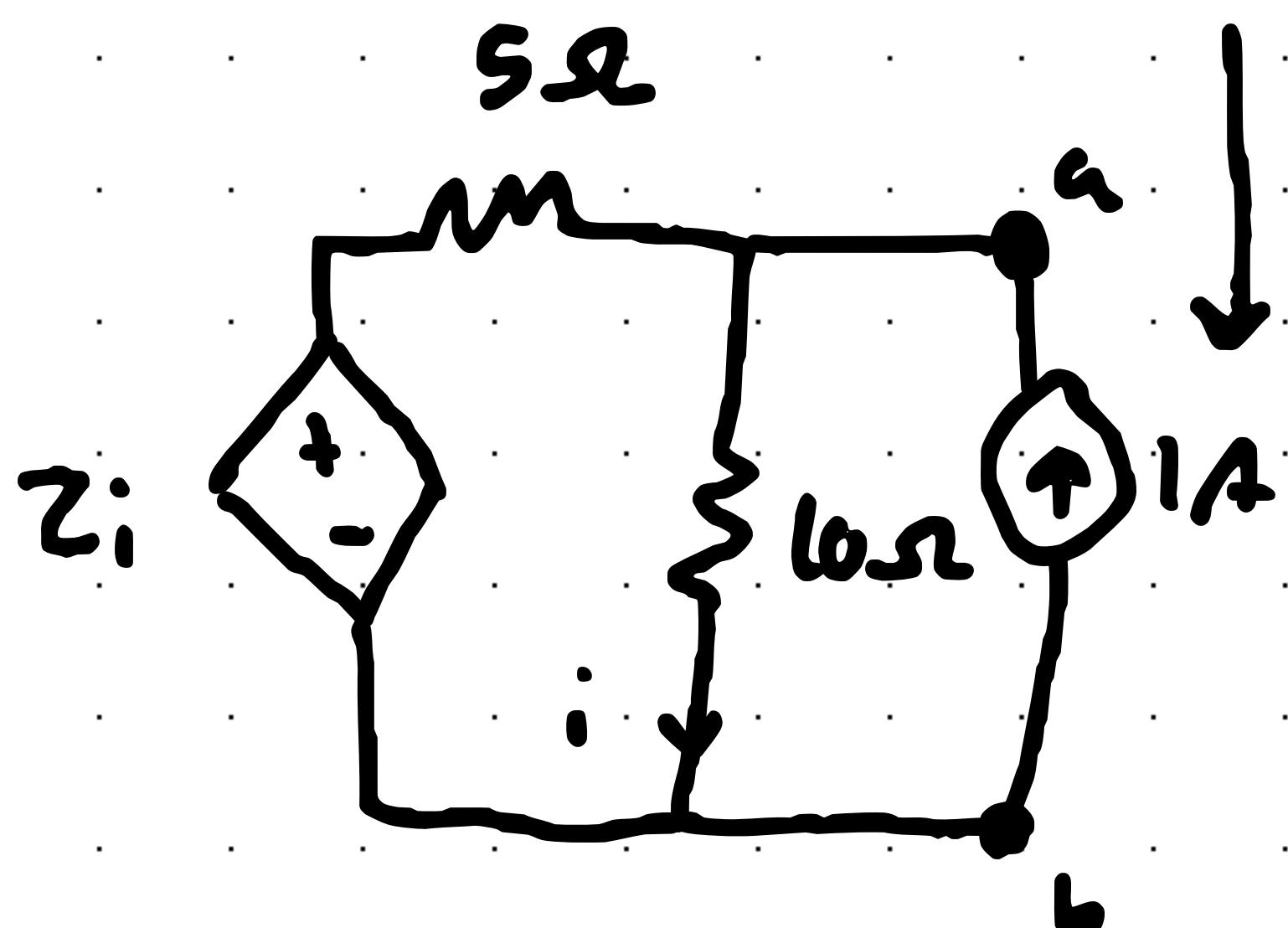
Well, There are two independent sources here...

Since there are no independent sources, I know
the only effect is that current is equal to Z_{TH} ...

So, Method one doesn't really work does it?

$$R_{TH} = \frac{0}{0} = \text{undefined...}$$

Method



To calculate $R_N = R_{TH}$

$$\sum I = 0$$

Node ① $\frac{v_1 - z_i}{5} + \frac{v_1}{10} + (-1) = 0$

$$i = \frac{v_1}{10}$$

$$\frac{v_1 - 2(\frac{v_1}{10})}{5} + \frac{v_1}{10} + (-1) = 0$$

$$v_1 = 3.85$$

$$R_{TH} = R_N = \frac{v_1}{i} = 3.85 \Omega$$