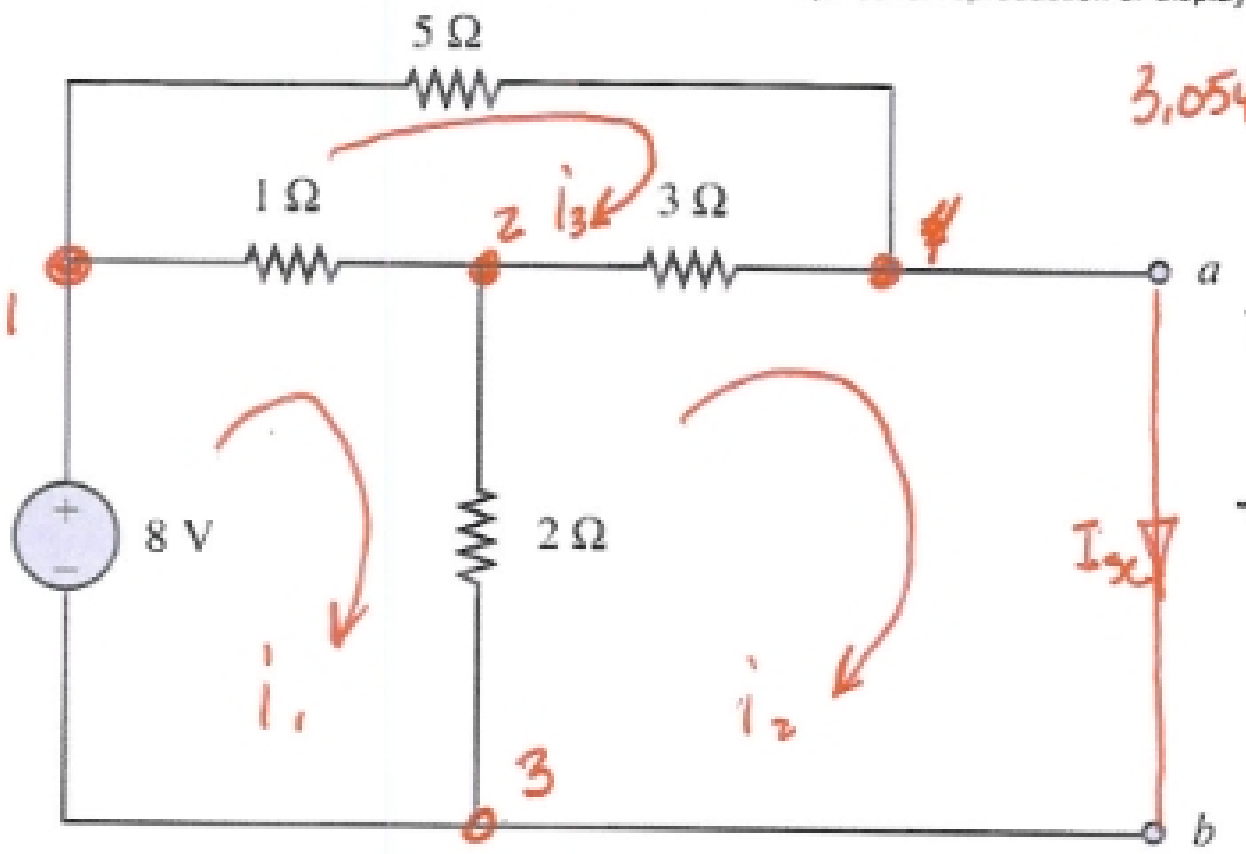
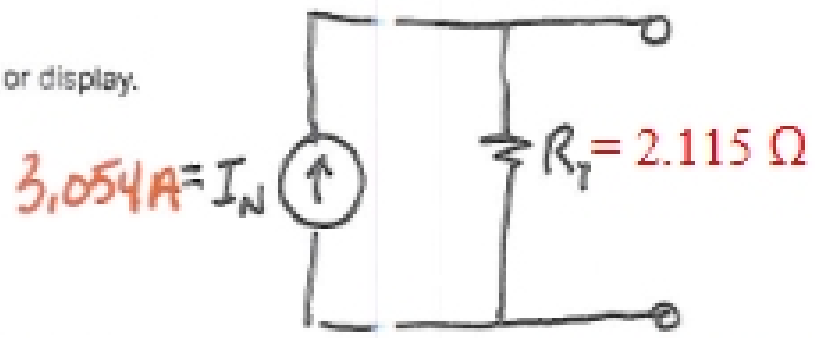
3.54 Norton Equivalent

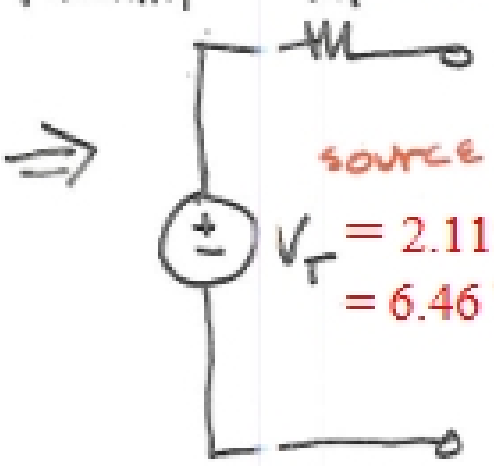


Norton



Thevenin

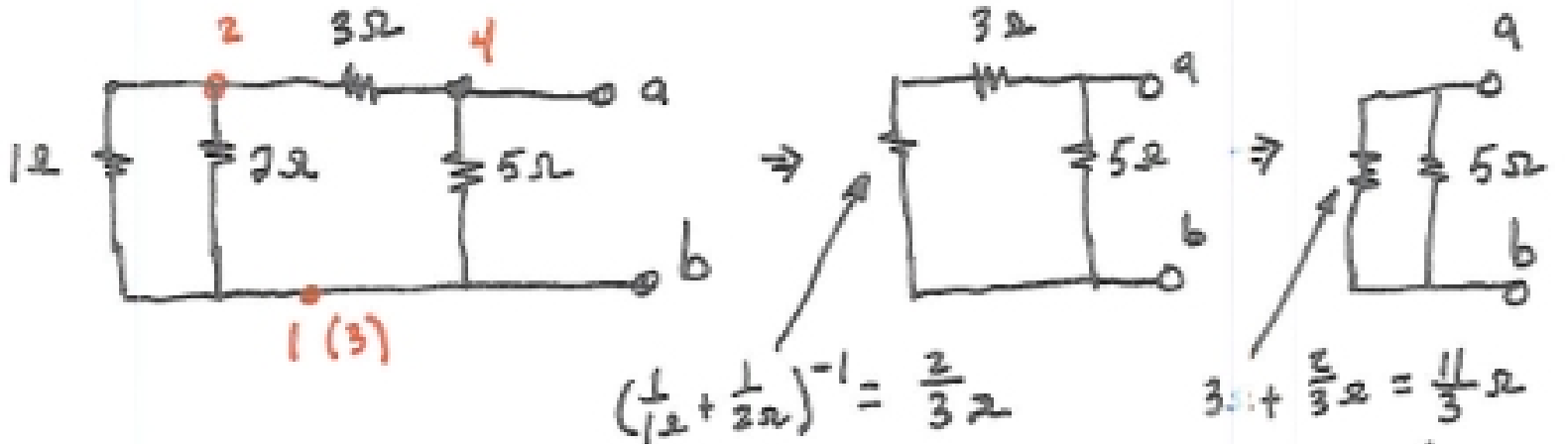
$R_T = 2.115\ \Omega$



source transform:

$V_T = 2.115\ (3.054)\ V$
$= 6.46\ V$

A. Remove sources & find resistance
→ replace 8V source with a short circuit
this means node 1 and node 3 become one node



B. Short a to b & find current
Can use Node Voltage or Mesh Current

Using Mesh current
1. Label Meshes $n = 3$

$M1: \Sigma V_n = -8V + 1\Omega(i_1 - i_3) + 2\Omega(i_1 - i_2) = 0$

$M2: \Sigma V_n = 2\Omega(i_2 - i_1) + 3\Omega(i_2 - i_3) = 0$

$M3: \Sigma V_n = 5\Omega\, i_3 + 3\Omega(i_3 - i_2) + 1\Omega(i_3 - i_1) = 0$

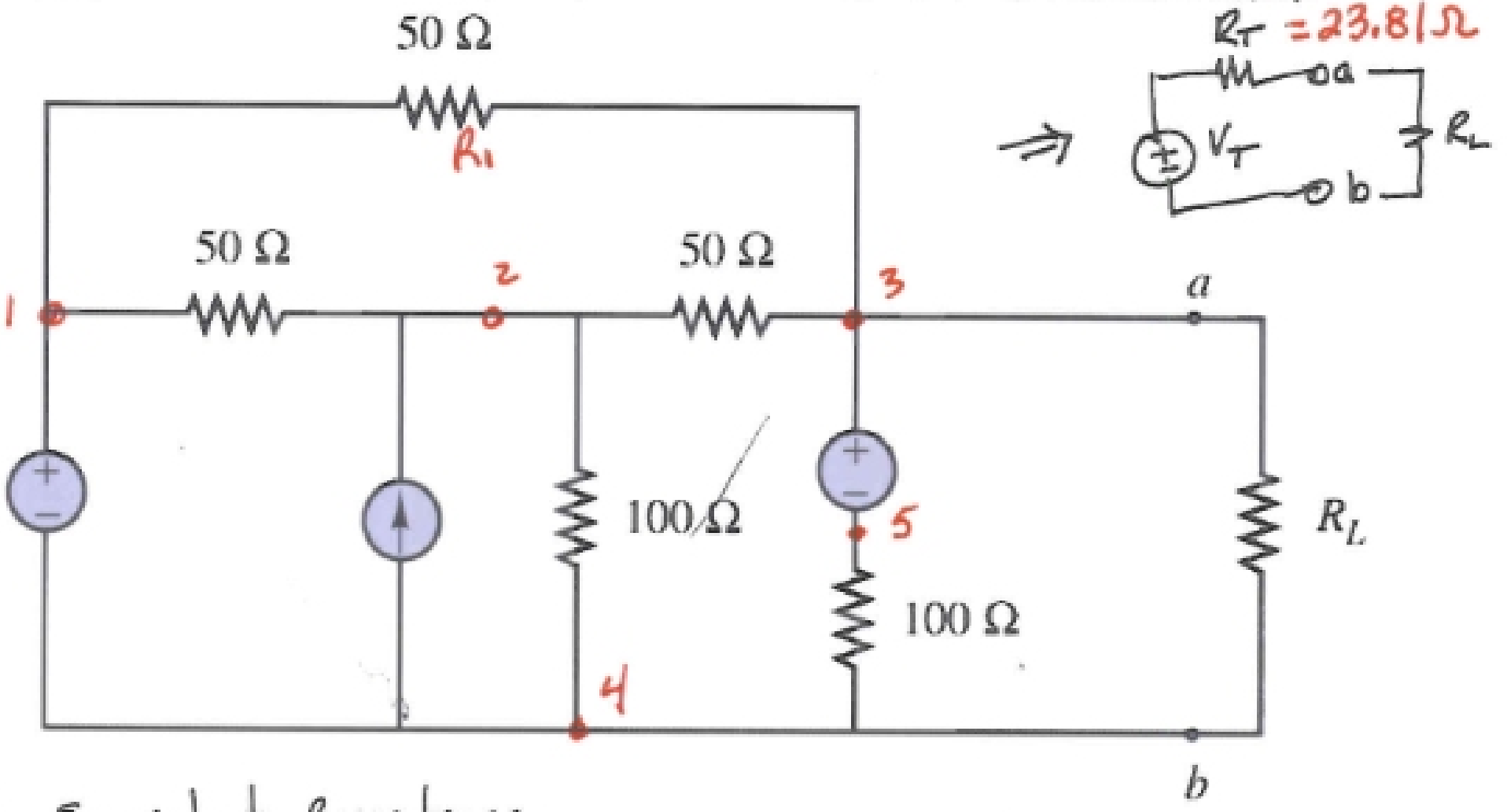
3.54 (Cont)

$$\begin{bmatrix} 3\Omega & -2\Omega & -1\Omega \\ -2\Omega & 5\Omega & -3\Omega \\ -1\Omega & -3\Omega & 9\Omega \end{bmatrix} \begin{bmatrix} i_1 \\ i_2 \\ i_3 \end{bmatrix} = \begin{bmatrix} 8V \\ 0 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} i_1 \\ i_2 \\ i_3 \end{bmatrix} = \begin{bmatrix} 5.236 \\ 3.054 \\ 1.6 \end{bmatrix} \begin{matrix} A \\ A \\ A \end{matrix}$$

$$I_{sc} = i_2 = 3.054\,A$$

3.56 Thevinin Equivalent Resistance

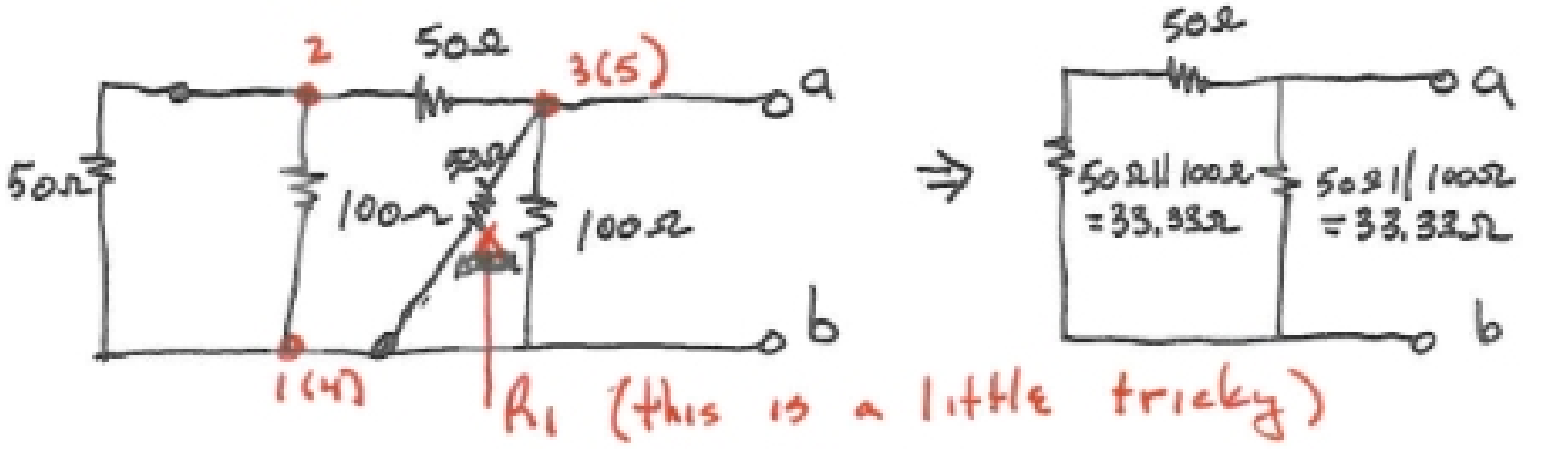


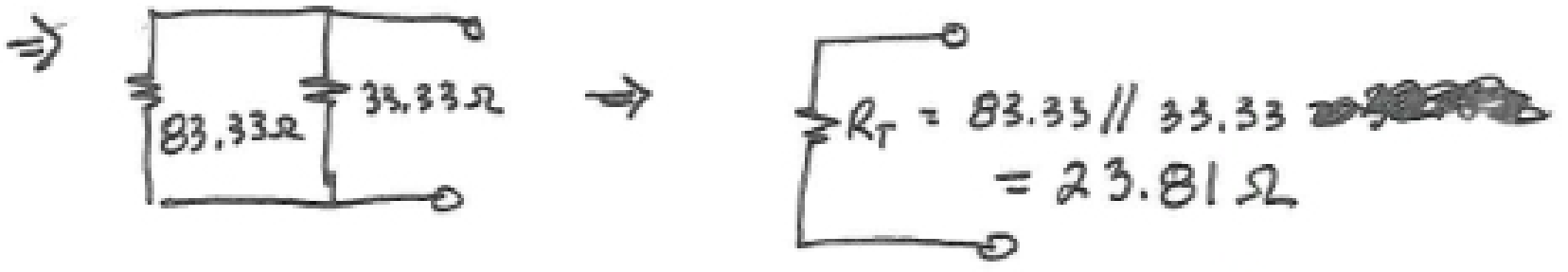
A. Equivalent Resistance
→ short voltage sources & open circuit current sources

Nodes 1 & 4 become same node
" 3 & 5 " " "

Remove load (R_L)

$50 \| 100 = \left(\frac{1}{50} + \frac{1}{100}\right)^{-1} = 33.33$





Notice that we are only finding the equivalent resistance, R_T, we not solving for V_T.