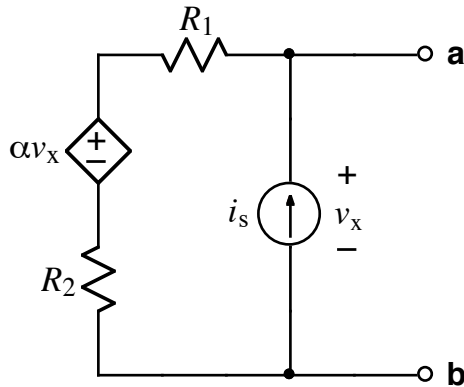


Ex:



Find the Thevenin equivalent circuit at terminals a-b. v_x must not appear in your solution. **Note:** $\alpha \neq 1$.

SOL'N: The voltage across the **a-b** terminals with no load connected is equal to the Thevenin equivalent voltage.

With no load, we define the reference node to be **b**, and the voltage at **a** to be v_{Th} . Then $v_x = v_{Th}$. We use the node-voltage method to find v_{Th} :

$$\frac{v_{Th} - \alpha v_{Th}}{R_1 + R_2} - i_s = 0 \text{ A} \quad \text{or} \quad v_{Th} = \frac{i_s(R_1 + R_2)}{1 - \alpha}$$

To find R_{Th} , we can find the short-circuit current flowing through a wire connected from **a** to **b**. With the reference node at **b** now connected to **a** by a wire, we have 0 V at **a**. This means that $v_x = 0$ V. The dependent source is also 0 V and turns into a wire. Now we have a current divider with i_s splitting between the wire from **a** to **b** and $R_1 + R_2$. All the current flows through the wire as the path of least resistance. So the short circuit current, i_{sc} , equals i_s .

$$i_{sc} = i_s$$

The ratio of v_{Th} to i_{sc} is R_{Th} :

$$R_{Th} = \frac{v_{Th}}{i_{sc}} = \frac{\frac{i_s(R_1 + R_2)}{1 - \alpha}}{i_s} = \frac{R_1 + R_2}{1 - \alpha}$$