

Electrical Circuit (1)

Thevenin Theorem (Week9 Class1)

Dr. Akram Al-Mahrouk

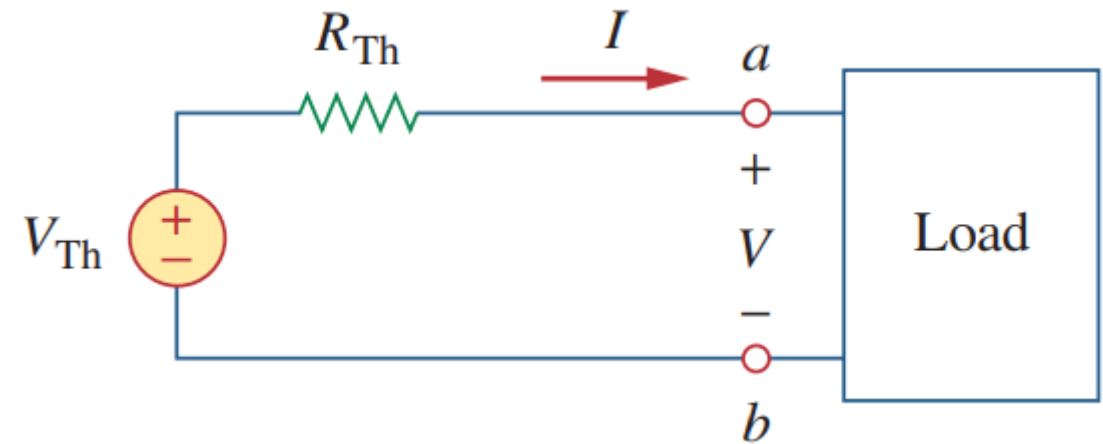
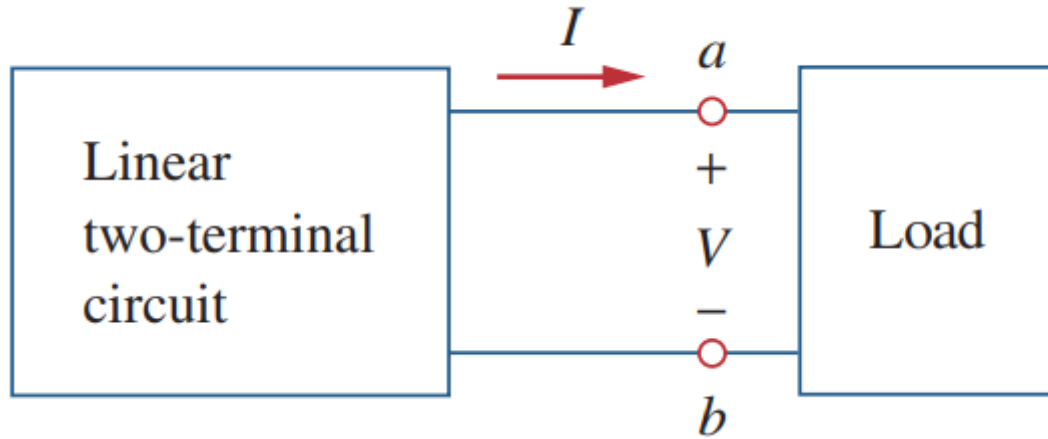
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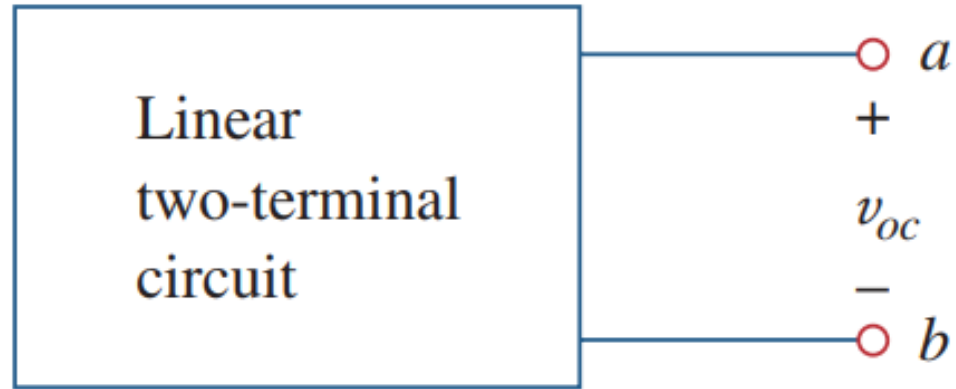
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Thevenin's Theorem

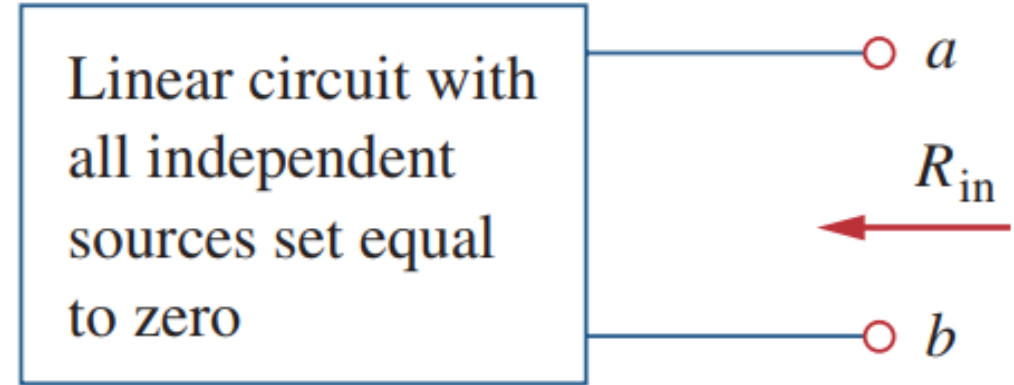
Thevenin's theorem states that a linear two-terminal circuit can be replaced by an equivalent circuit consisting of a voltage source V_{Th} in series with a resistor R_{Th} , where V_{Th} is the open-circuit voltage at the terminals and R_{Th} is the input or equivalent resistance at the terminals when the independent sources are turned off.



Thevenin's Theorem

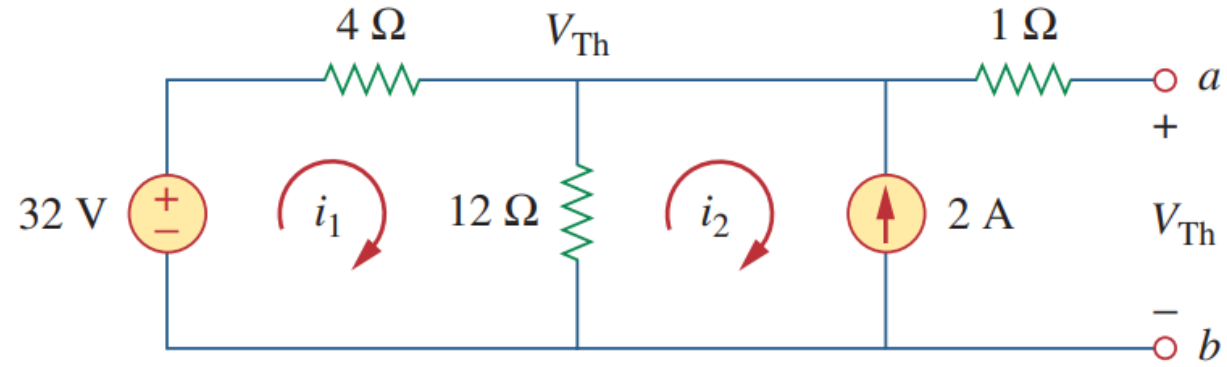
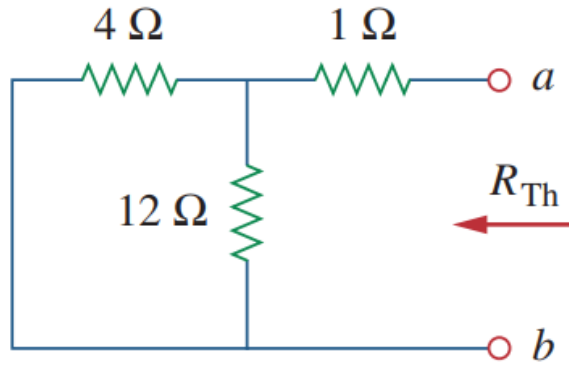
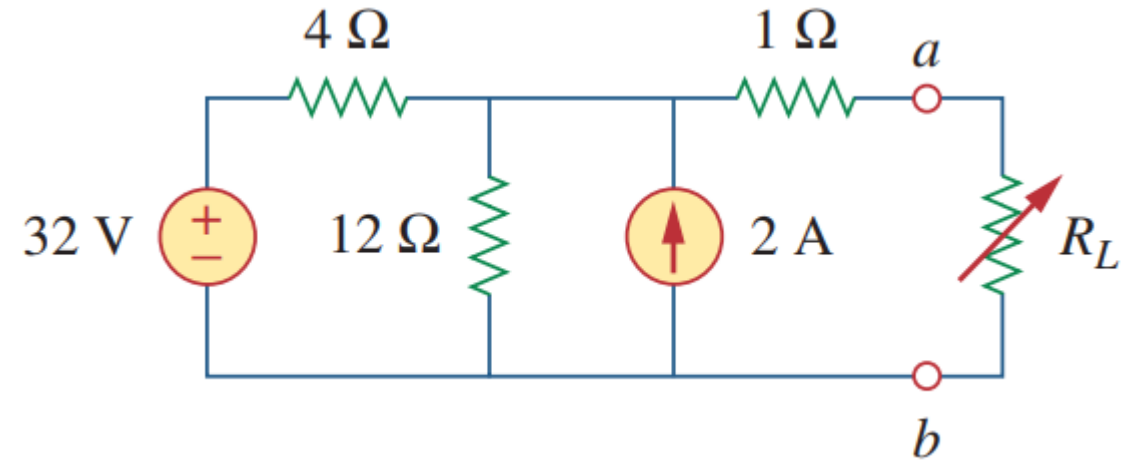


$$V_{\text{Th}} = v_{oc}$$

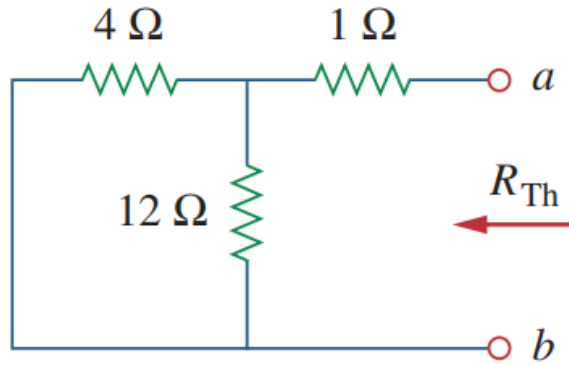
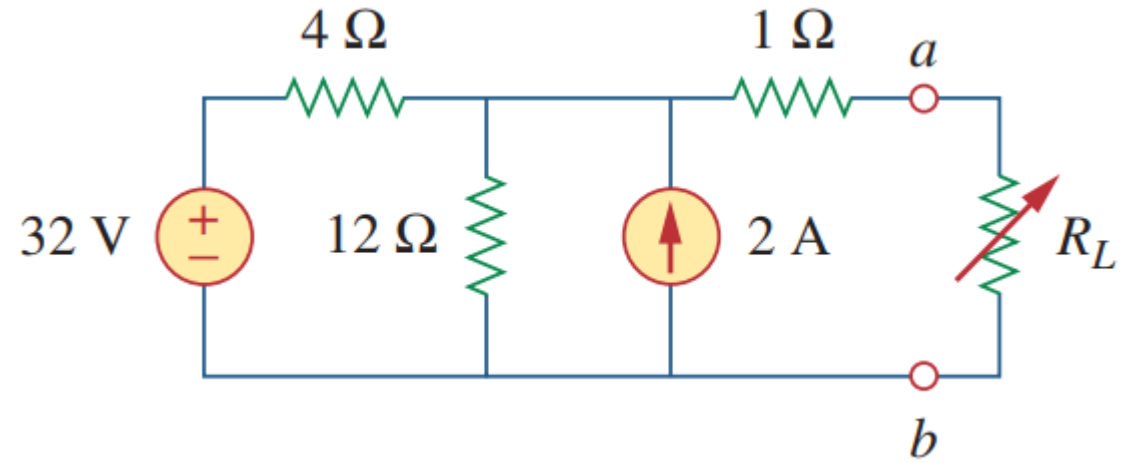


$$R_{\text{Th}} = R_{\text{in}}$$

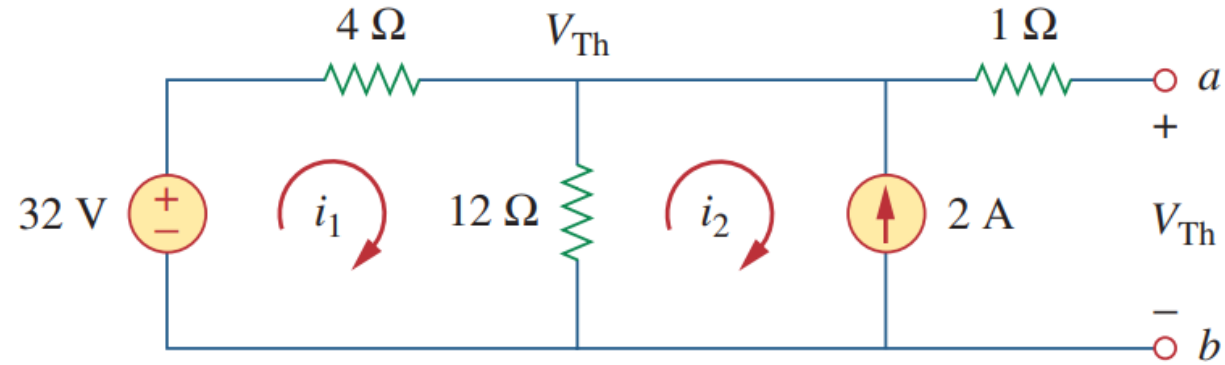
Thevenin's Theorem



Thevenin's Theorem



$$R_{th} = (4 \parallel 12) + 1 = 4 \Omega$$



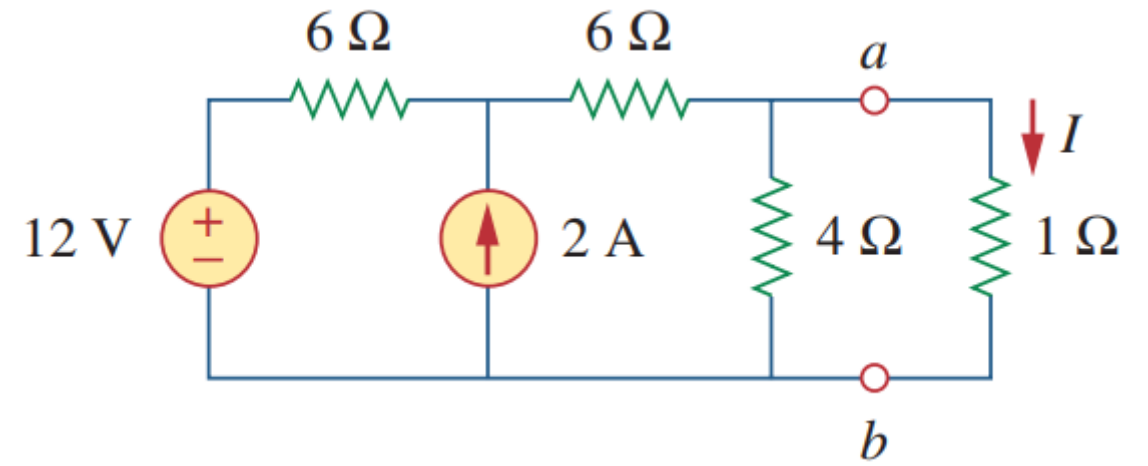
$$-32 + 4i_1 + 12i_1 - 12i_2 = 0$$

$$i_2 = -2A \quad i_1 = 0.5A$$

$$V_{th} = (0.5 - -2) * 12 = 30V$$

Thevenin's Theorem

Answer: $V_{Th} = 6\text{ V}$, $R_{Th} = 3\ \Omega$, $I = 1.5\text{ A}$.



Thevenin's Theorem

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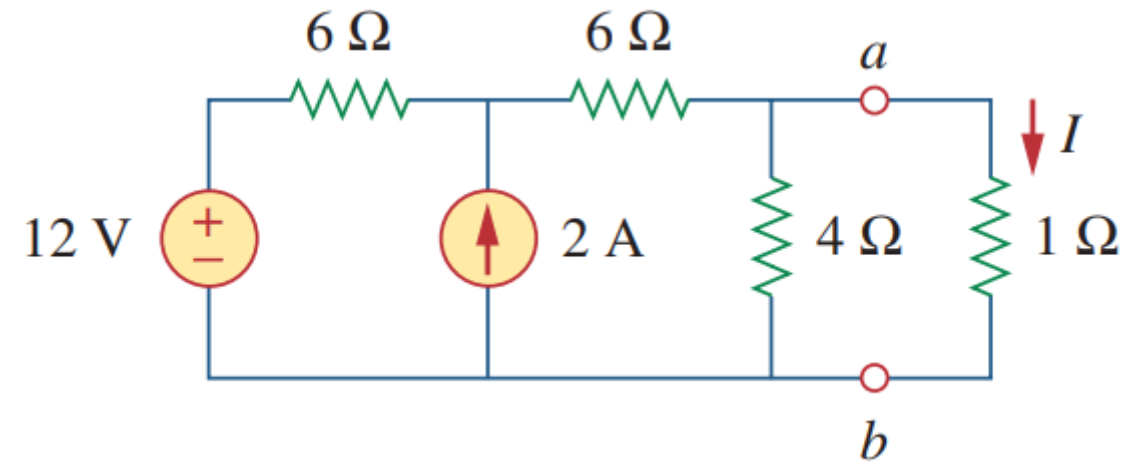
$$R_{th} = (6 + 6) \parallel 4 = 3\ \Omega$$

$$-12 + 6i_1 + 6i_2 + 4i_2 = 0$$

$$i_2 - i_1 = 2$$

$$i_1 = -0.5\text{ A} \quad i_2 = 1.5\text{ A}$$

$$V_{th} = (1.5) * 4 = 6\text{ V}$$



Electrical Circuit (1)

Norton's Theorem (week9 class2)

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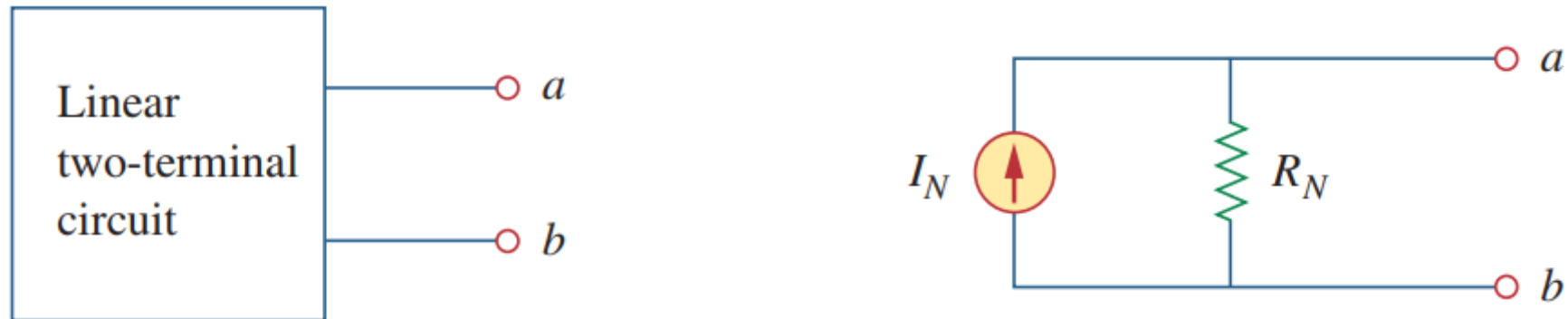
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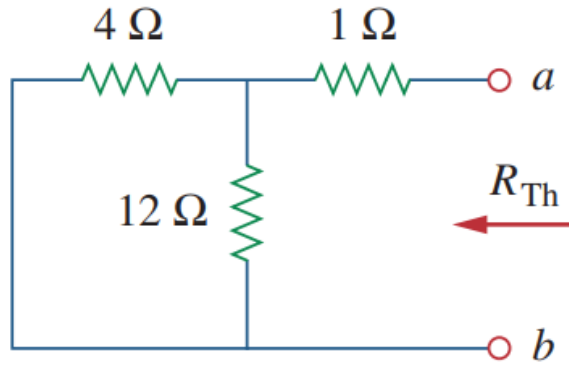
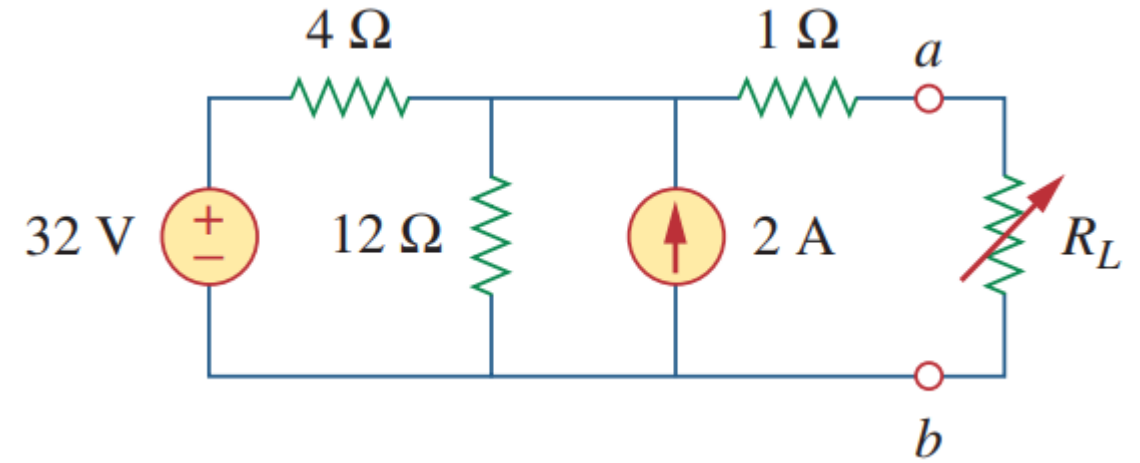
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Norton's Theorem

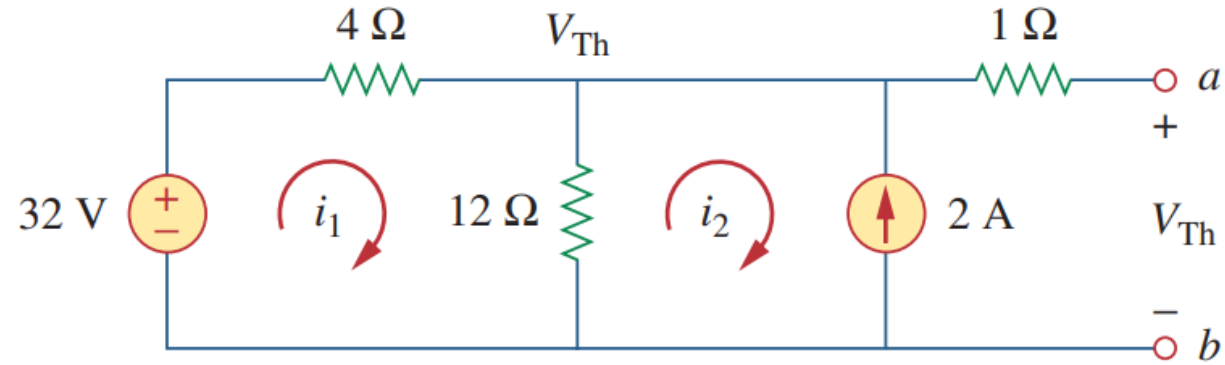
Norton's theorem states that a linear two-terminal circuit can be replaced by an equivalent circuit consisting of a current source I_N in parallel with a resistor R_N , where I_N is the short-circuit current through the terminals and R_N is the input or equivalent resistance at the terminals when the independent sources are turned off.



Norton's Theorem



$$R_{th} = (4 || 12) + 1 = 4 \Omega$$



$$-32 + 4i_1 + 12i_1 - 12i_2 = 0$$

$$i_2 = -2A \quad i_1 = 0.5A$$

$$V_{th} = (0.5 - -2) * 12 = 30V$$

Norton's Theorem

Answer: $V_{Th} = 6\text{ V}$, $R_{Th} = 3\ \Omega$, $I = 1.5\text{ A}$.

$$R_{th} = (6 + 6) \parallel 4 = 3\ \Omega$$

$$-12 + 6i_1 + 6i_2 + 4i_2 = 0$$

$$i_2 - i_1 = 2$$

$$i_1 = -0.5\text{ A} \quad i_2 = 1.5\text{ A}$$

$$V_{th} = (1.5) * 4 = 6\text{ V}$$

