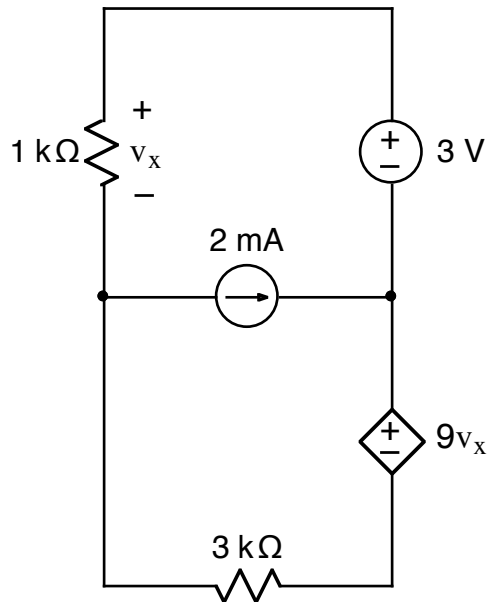
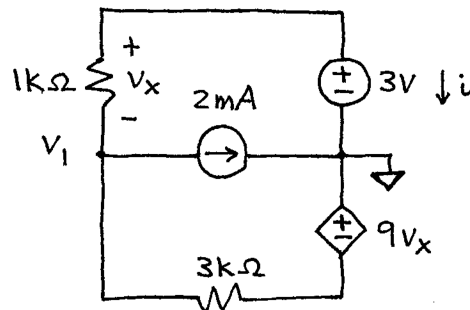


Ex:



Calculate the power consumed by the 3V source. **Note:** If a source supplies power, the power it consumes is negative.

sol'n: Any method of solving the circuit is acceptable. Here, we use the node-voltage method. We place the reference at the node on the right side.



We first define v_x in terms of node voltage:

$$v_x = 3V - v_1$$

Our node voltage eq'n at v_1 :

$$\frac{v_1 - 3V}{1k\Omega} + 2mA + \frac{v_1 - (-9(3V - v_1))}{3k\Omega} = 0A$$

Rearranging the eq'n, we have

$$v_1 \left(\frac{1}{1k\Omega} + \frac{1}{3k\Omega} - \frac{9}{3k\Omega} \right) = \frac{3V}{1k\Omega} - 2mA - \frac{9(3V)}{3k\Omega}$$

Multiplying both sides by $3k\Omega$ gives

$$v_1 (3 + 1 - 9) = 9V - 6V - 27V = -24V$$

or

$$v_1 = \frac{-24V}{-5} = \frac{24}{5} V.$$

The current, i , thru the $3V$ source is

$$i = \frac{v_1 - 3V}{1k\Omega} = \frac{\frac{24}{5}V - \frac{15}{5}V}{1k\Omega} = \frac{9V}{5k\Omega} = \frac{9}{5} mA.$$

The power for the $3V$ source is $p = v_i = 3V \cdot i$:

$$p = 3V \cdot \frac{9}{5} mA = \frac{27}{5} mW = 5.4 mW$$