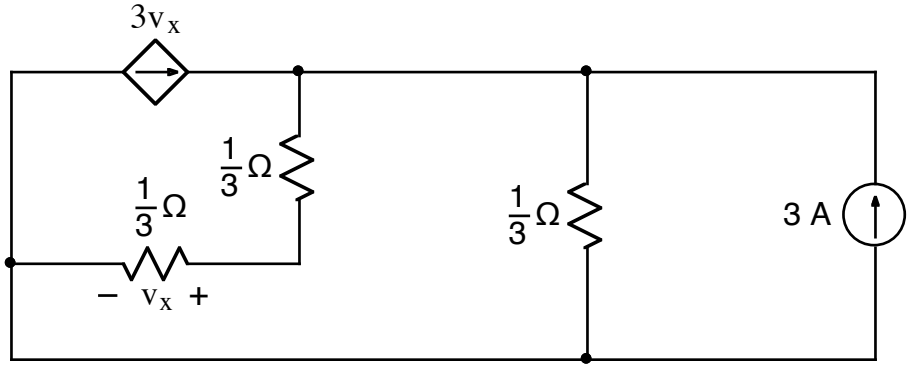
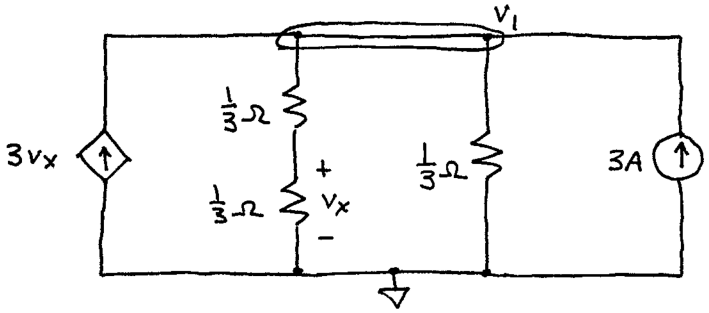
Ex:



Calculate the power dissipated in the dependent current source, (labeled $3v_x$).

Soln: Any method of solution is allowed, (provided it is a valid approach).

We'll use node-voltage method with reference on bottom and v_1 on top. It also helps to redraw circuit.



We write v_x in terms of v_1 by using a voltage divider:

$$v_x = v_1 \cdot \frac{1/3\ \Omega}{\frac{1}{3}\Omega + \frac{1}{3}\Omega} = \frac{v_1}{2}$$

Now we write the current summation eq'n for node v_1.

$$-3\left(\frac{v_1}{2}\right) + \frac{v_1}{\frac{1}{3}\Omega + \frac{1}{3}\Omega} + \frac{v_1}{\frac{1}{3}\Omega} - 3A = 0A$$

(v_x)

or $v_1\left(-\frac{3}{2\Omega} + \frac{3}{2\Omega} + \frac{3}{\Omega}\right) = 3A$

or $v_1 = 1A \cdot \Omega = 1V$

So we have $+\ v_1\ -$ $3v_x = 3\frac{v_1}{2} = \frac{3}{2}A$ $-v_1 = -1V$ $-\ +$

Power is $p = iv$ where i, v follow passive sign convention.

$$p = \frac{3}{2}A \cdot (-1V) = -\frac{3}{2}W$$

Note: In this problem we can replace the dependent src with a resistor, (even before we know the value of v_1).

We have voltage v_1 across dependent src and current $-3v_x = -3\frac{v_1}{2}$

$+\ v_1\ -$ $3v_x$ $\downarrow i = -3v_x = -\frac{3v_1}{2\Omega}$

Then $R_{eq} = \frac{v_1}{-\frac{3}{2}v_1} = -\frac{2}{3}\Omega$.

Use this instead of dependent src: $-\frac{2}{3}\Omega$