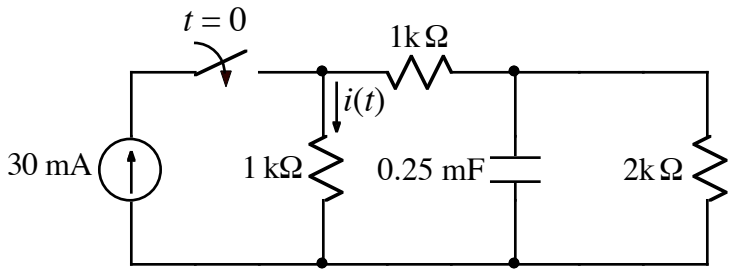
HOMEWORK #12 solution

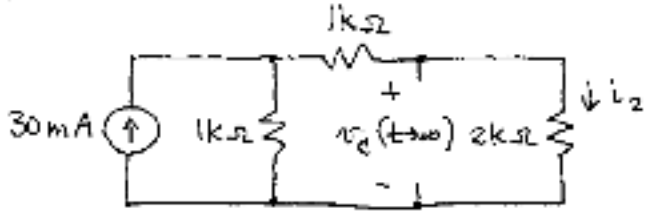
Ex:



After being open for a long time, the switch closes at $t = 0$.

Calculate the energy stored on the capacitor as $t \to \infty$.

soln: We use the general solution-approach and treat C as an open circuit as $t \to \infty$.



We observe that v_c is the same as the voltage across the 2 kΩ resistor, $i_2 \cdot 2k\Omega$:

$$v_c(t\to\infty) = i_2 \cdot 2k\Omega$$

To find i_2, we use a current divider:

$$i_2 = 30\,mA \cdot \frac{1k\Omega}{1k\Omega + 1k\Omega + 2k\Omega} = 7.5\,mA$$

(1kΩ on left side)

$$v_c(t\to\infty) = 7.5\,mA \cdot 2k\Omega = 15\,V$$

$$\text{Energy on } C \equiv w_c = \frac{1}{2} C v_c^2 = \frac{1}{2} \frac{1}{4} mF \cdot (15V)^2$$

$$w_c = 28.125\,mJ$$