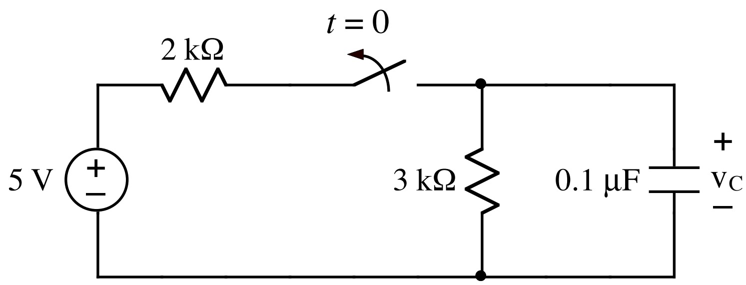
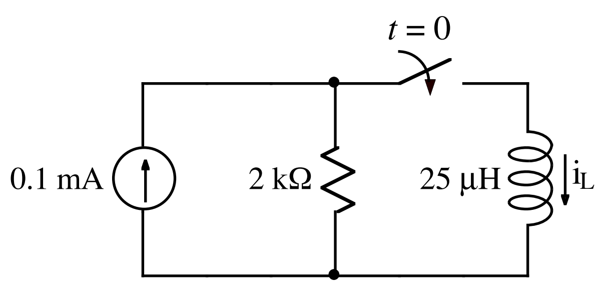
Homework 9

1.



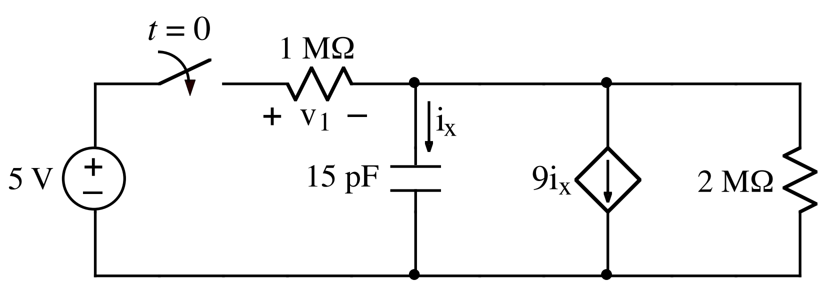
After being closed for a long time, the switch opens at $t = 0$. Find $v_C(t)$ for $t > 0$. Hint: use a Thevenin equivalent for the voltage source and resistors for $t < 0$.

2.



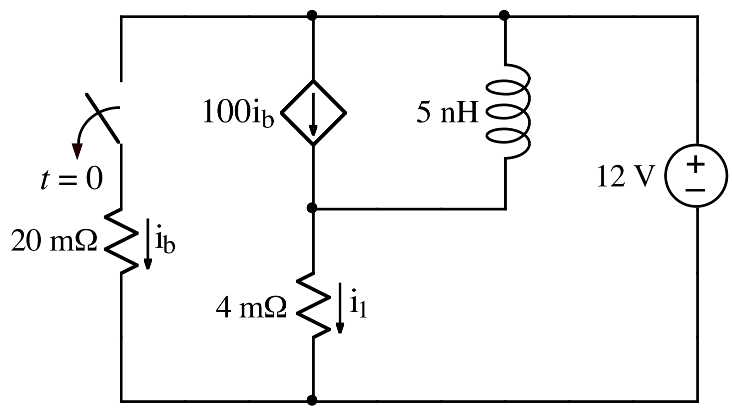
After being open for a long time, the switch closes at $t = 0$. $i_L(t = 0^-) = 0A$. Find $i_L(t)$ for $t > 0$.

3.



After being open for a long time, the switch closes at $t = 0$. Find $v_1(t)$ for $t > 0$.

4.



After being closed for a long time, the switch opens at $t = 0$.

a) Find $i_L(0^-)$ for the above circuit.

b) For $t > 0$, find the Thevenin equivalent of the above circuit as seen from the terminals where the inductor is attached. In other words, remove the inductor from the above circuit and find the Thevenin equivalent of the circuit as seen by looking into the wires where the inductor was attached.

5. For the circuit in problem 4, find $i_1(t)$ for $t > 0$.

Answers:

1. $v_C(t>0) = 3\,\text{V}\,e^{-t/300\,\mu\text{s}}$
2. Hint: $\tau = 12.5\,\text{ns}$ and $i_L(t \to \infty) = 0.1\,\text{mA}$
3. $v_1(t) = \frac{5}{3} + \frac{10}{3} e^{-t/100\,\mu\text{s}}\,\text{V}$

4.b. Hint: $R_{\text{Th}} = 4\,\text{m}\Omega$

5. $i_1(t>0) = 3\,\text{kA} - 60\,\text{kA} \cdot e^{-t/1.2\,\mu\text{s}}$