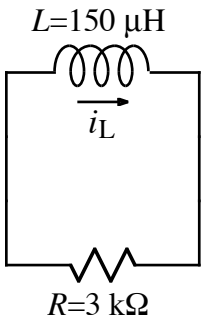
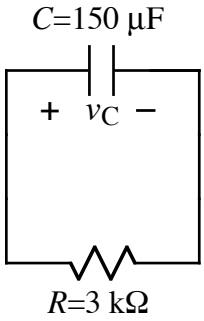
Homework 8

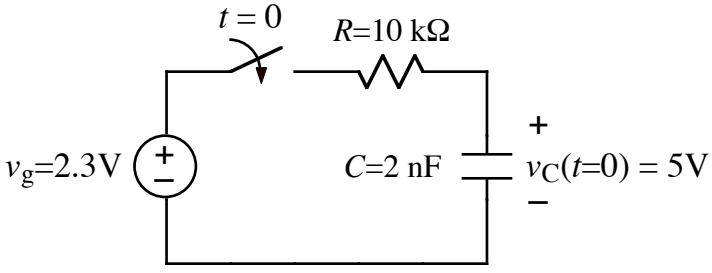
1. Find the current, i_L, through the inductor in the circuit below for $t > 0$ if $i_L(t = 0) = 100$ μA.



2. Find the voltage, v_C, across the capacitor in the circuit below for $t > 0$ if $v_C(t = 0) = 100$ μV.



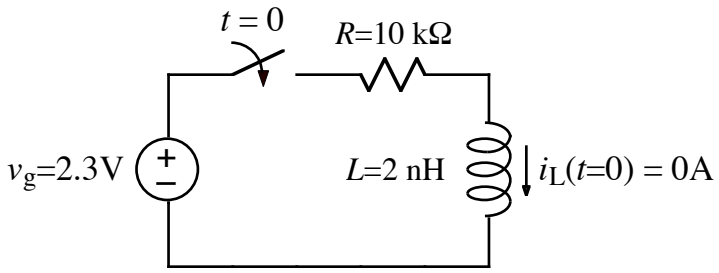
3. After being open for a long time, the switch closes at $t = 0$.



a) Find an expression for $v_C(t)$ for $t \geq 0$.

b) Find the energy stored in the capacitor at time $t = 30$ μs.

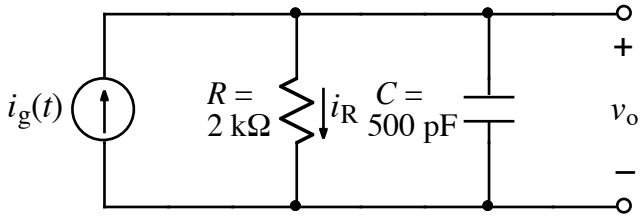
4.



a) Find an expression for $i_L(t)$ for $t \geq 0$.

b) Find the energy stored in the inductor at time $t = 30$ μs.

5. After being zero for a long time, the value of $i_g(t)$ changes to 15 mA at $t = 0$ (and remains at 15 mA as time increases to infinity).



a) Find an expression for $v_o(t)$ for $t > 0$.

b) Find the current, i_R, in R as a function of time.

Answers:

1. $i_L(t>0) = 100\,\mu\text{A}\,e^{-t/50\,\text{ns}}$
2. Hint: $\tau = 450\,\text{ms}$

3.b. $w_C = 8.42\,\text{nJ}$

4.a. $i_L(t \geq 0) = 0.23\,\text{mA} - 0.23\,\text{mA} \cdot e^{-t/0.2\,\text{ps}}$

5.b. $i_R(t \geq 0) = 15\,\text{mA} - 15\,\text{mA} \cdot e^{-t/1\,\mu\text{s}}$