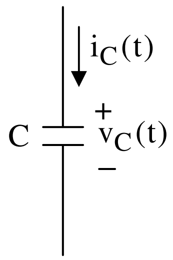
UNIVERSITY OF UTAH
ELECTRICAL & COMPUTER ENGINEERING DEPARTMENT

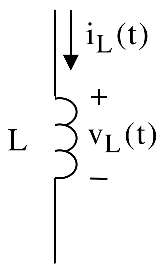
ECE 1270 **HOMEWORK #5** Summer 2010

1. In a-c, the voltage $v_C(t)$ across a 5nF capacitor is listed. Find the current, $i_C(t)$, flowing in the capacitor in each case as a function of time:



(a) $v_C(t) = 8V$
(b) $v_C(t) = 25t \text{ kV/sec}$
(c) $v_C(t) = 5k\cos(2\pi \cdot 20 \cdot t)V$

2. In a-c, the current $i_L(t)$ flowing into a $3\mu H$ inductor is listed. Find the voltage, $v_L(t)$, across the inductor in each case as a function of time.



(a) $i_L(t) = 29nA$
(b) $i_L(t) = 35t\mu A$
(c) $i_L(t) = 2 - 0.2e^{-t/2m\sec}A$

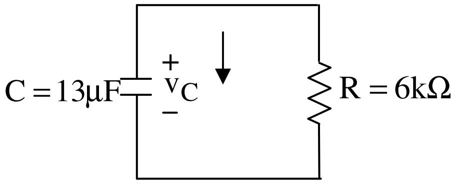
3. The following equation describes the voltage, v_C, across a capacitor as a function of time. Find the time, t, at which v_C is equal to -6V. Plot $v_C(t)$. You may use Matlab.

$$v_C(t) = 6 - 6\left(1 - e^{-t/10\mu s}\right)V$$

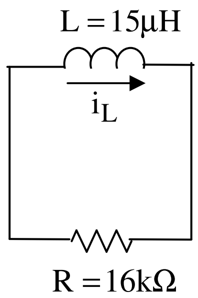
4. The following equation describes the voltage, v_L, across an inductor as a function of time. Find an expression for the current, $i_L(t)$, through the inductor as a function of time. Assume that $i_L(t = 0) = 0A$. Plot $i_L(t)$. You may use Matlab.

$$v_L(t) = 2e^{-t/20ms}V$$

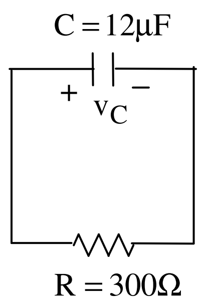
5. Find the voltage, v_C, on the capacitor in the circuit below as a function of time if the initial condition is $v_C(t = 0^+) = 2V$.



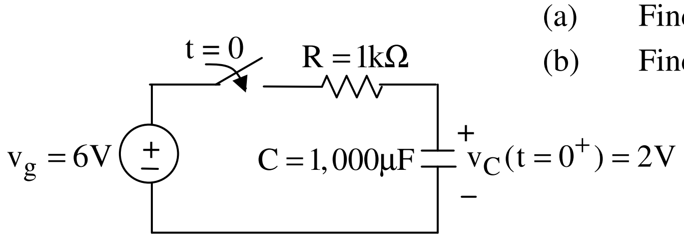
6. Find the current, i_L, through the inductor in the circuit below for $t > 0$ if $i_L(t = 0) = 13\text{mA}$.



7. Find the voltage, v_C, across the capacitor in the circuit below for $t > 0$ if $v_C(t = 0) = 5V$.



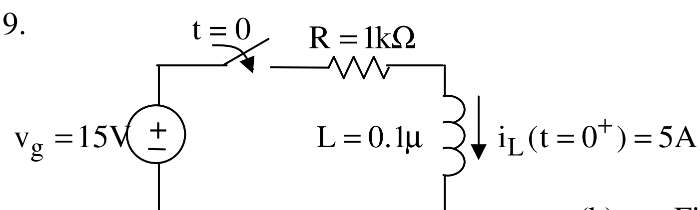
8. After being open for a long time, the switch closes at t = 0.



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

(b) Find the energy stored in the capacitor at time t = 2s.

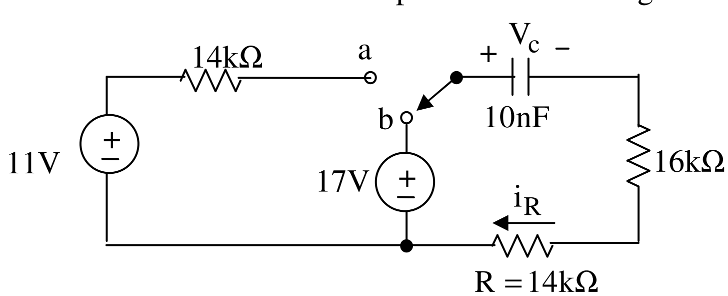
9.



(a) Find an expression for $i_L(t)$ for $t \geq 0$. Note: Assume the initial current in the L is created by circuitry not shown in the diagram.

(b) Find the energy stored in the inductor at time t = 1 ms.

10. The switch has been in a position a for a long time. It is switched to position b at t = 0.



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

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