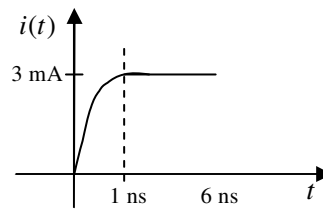
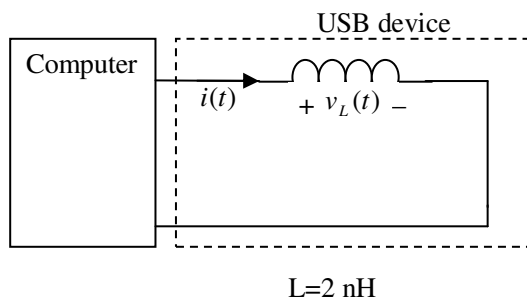


Homework Set #1**Textbook:** Chapter 6.1-6.2**Coverage:** Capacitance and self inductance**DUE Thursday, March 8, 2012**

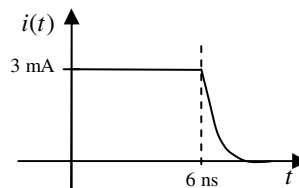
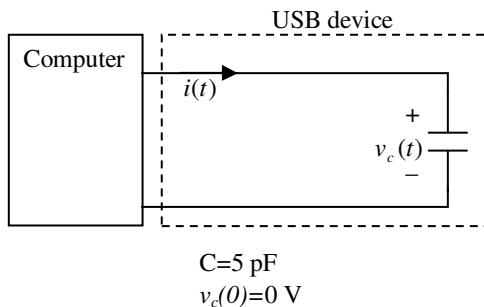
For problems 3 and 4, you must do the calculus by hand, but you can use a calculator for the arithmetic.

1. Problem 6.1 on page 204 (*answers in back of book*)
2. Problem 6.17 on page 206 (*answers in back of book*)
3. A computer communicates over wires (such as a USB cable) by sending very short pulses. The device at the far end of the cable (such as a memory stick) senses the pulses with electronics which have inductance and capacitance. They can be modeled with the appropriate valued device as shown below.



$$i(t) = \begin{cases} 0 & t \leq 0 \text{ ns} \\ 3(1 - e^{-4 \times 10^9 t}) \text{ mA} & 0 \text{ ns} \leq t < 1 \text{ ns} \\ 3 \text{ mA} & 1 \text{ ns} \leq t < 6 \text{ ns} \\ 0 & t \geq 6 \text{ ns} \end{cases}$$

- (a) Find the voltage $v_L(t)$ for $0 \text{ ns} < t \leq 1 \text{ ns}$ and plot your results.
 - (b) Find the power absorbed by the inductor at $t = 0.5 \text{ ns}$.
 - (c) Find the energy stored in the inductor at $t = 0.5 \text{ ns}$.
4. A computer communicates over wires (such as a USB cable) by sending very short pulses. The device at the far end of the cable (such as a memory stick) senses the pulses with electronics which have inductance and capacitance. They can be modeled with the appropriate valued device as shown below.



$$i(t) = \begin{cases} 3 \text{ mA} & 0 \text{ ns} \leq t < 6 \text{ ns} \\ 3e^{-4 \times 10^9(t - 6 \times 10^{-9})} \text{ mA} & 6 \text{ ns} \leq t < 7 \text{ ns} \\ 0 \text{ mA} & t \geq 7 \text{ ns} \end{cases}$$

- (a) Find the voltage $v_C(t)$ for $0 \text{ ns} < t < 7 \text{ ns}$ and plot your results.
- (b) Find the power absorbed by the capacitor at $t = 6.5 \text{ ns}$.
- (c) Find the energy stored in the capacitor at $t = 2 \text{ ns}$.