Homework Assignment #12 – due in class on Wednesday, Nov. 30, 2011

Supplemental Problem:

1. The voltage $v_C(t)$ across the capacitor in the circuit fragment shown below is given by $v_C(t) = 12 \cos(400\pi\, t)$ V.

   a. Find an expression for the voltage across the inductor. The simplest way to calculate the answer is to use phasors and impedances. You should solve the problem using this method, and your answer should be a sinusoidal function for $v_L(t)$.

   Describe how you would answer the question using only the time-domain voltage-current relationships for capacitors and inductors, as given in the table at the bottom of this page. You do not necessarily have to carry out all of the detailed computations, but make a list of the derivative and integral operations that would need to be evaluated. The objective is to appreciate the simplification provided by phasors and impedances!

   b. What is the total voltage drop $v_{tot}(t)$ across the two components?

   c. Compare the magnitude of v_{tot} to those of v_C and v_L. For most *practical* purposes, the magnitude of v_{tot} can be considered to be what value?

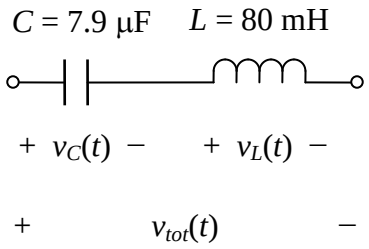

Table 5-4: Basic properties of R, L, and C.

Property	R	L	C
i–v relation	$i = \frac{v}{R}$	$i = \frac{1}{L}\int_{t_0}^{t} v\, dt + i(t_0)$	$i = C\frac{dv}{dt}$
v-i relation	$v = iR$	$v = L\frac{di}{dt}$	$v = \frac{1}{C}\int_{t_0}^{t} i\, dt + v(t_0)$