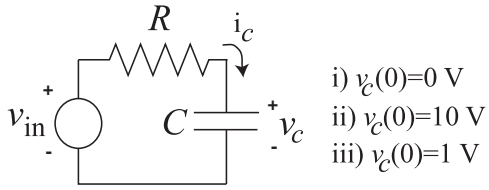
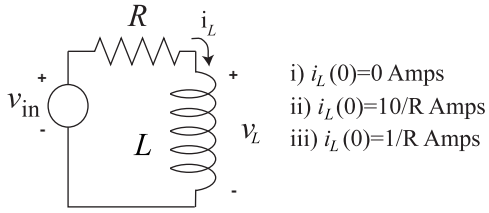
Due: Monday April 29, 2002

Problem 1:

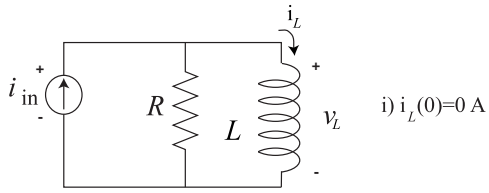
For each of the circuits below, derive the differential equation which relates input to output, and solve for the unit step response for the listed initial conditions. Note that some of the circuits use a current source input. In each case, make a sketch of the output vs. time.



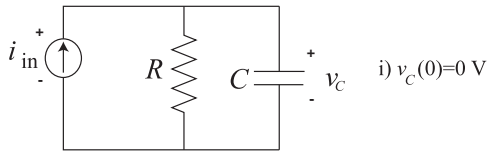
1. Solve for i_c as output



2. Solve for v_L as output

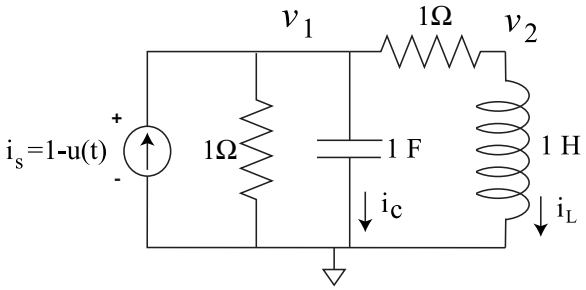


3. Solve for v_L as output



4. Solve for v_c as output

Problem 2: This problem studies the circuit shown below.



1. For t<0, what are the values of v_1, v_2, i_L, and i_c

2. What are the initial conditions at $t = 0^+$, i.e., the values of $v_1(0^+)$ and $\frac{dv_1}{dt}(0^+)$? Be sure to show how you derived these results.

3. For $t \geq 0$ a differential equation describing this circuit in terms of v_1 is

$$\frac{d^2v_1}{dt^2} + 2\frac{dv_1}{dt} + 2v_1 = 0.$$

Write the solution of this equation as a function of time for $T \geq 0$. Show carefully how you derived the solution and satisfied the initial conditions from the pervious section. If you were not able to derive the initial conditions, you can write your solution in terms of $v_1(0^+)$ and $\frac{dv_1}{dt}(0^+)$.