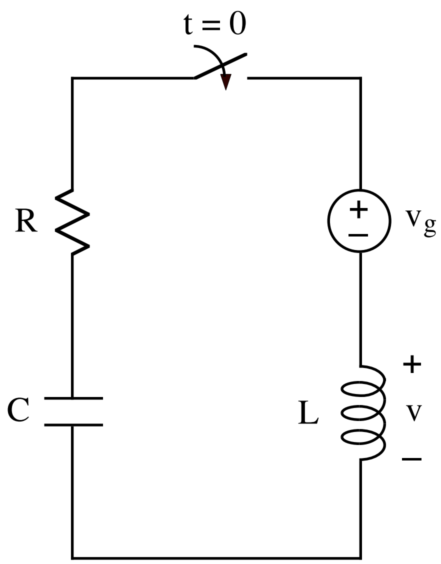
HOMEWORK #2

1.



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

The inductor carries no current at time $t = 0^-$, and
the capacitor stores no energy at time $t = 0^-$.

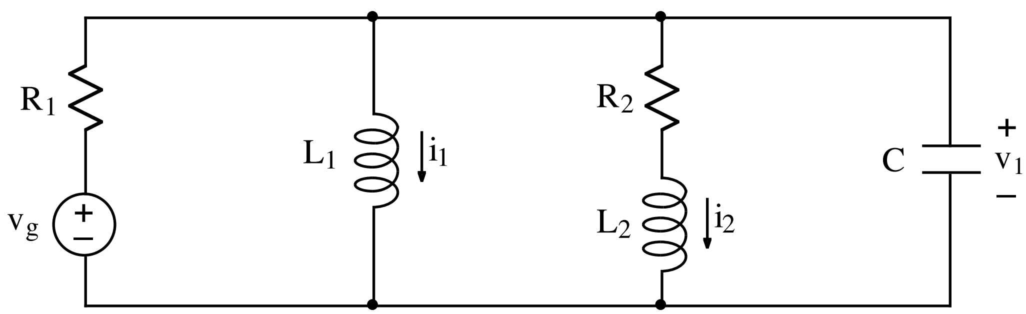
Give expressions for the following in terms of v_g, R, L, and C:

$v(t = 0^+)$ and $\left.\dfrac{dv(t)}{dt}\right|_{t=0^+}$

2. For the circuit in problem 1, find the numerical values of L and the characteristic root, s, given the following information:

$C = 1$ nF $\qquad R = 20\ \Omega \qquad$ circuit is Critically Damped

3.



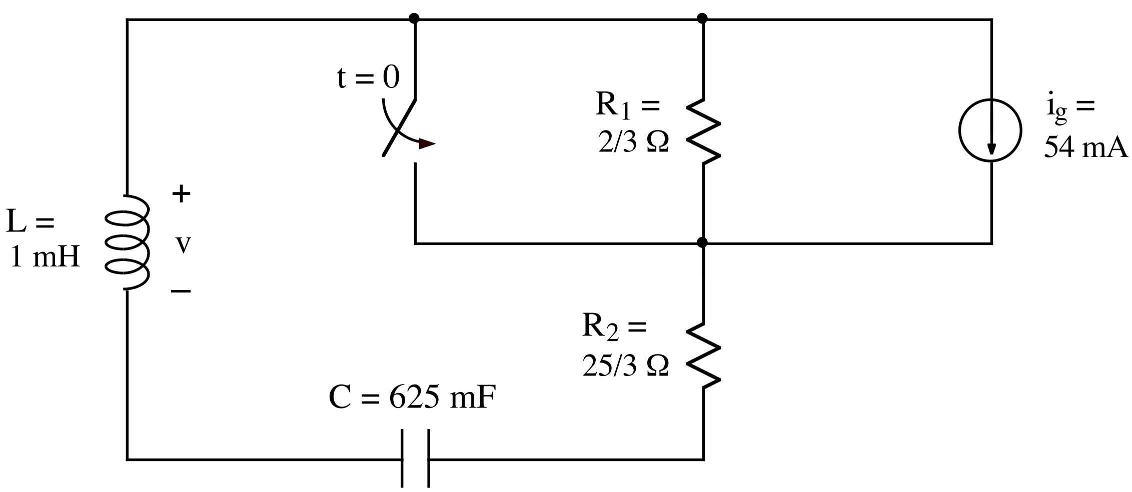
At $t = 0$, $v_g(t)$ switches instantly from $-v_o$ to v_o (where v_o is a constant).

a) Write the state-variable equations for the circuit in terms of the state vector:

$$\vec{x} = \begin{bmatrix} i_1 \\ i_2 \\ v_1 \end{bmatrix}$$

4. For the circuit in problem 3, evaluate the state vector at $t = 0^+$.

5.



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

a) State whether $v(t)$ is underdamped, overdamped, or critically damped.

b) Write a numerical time-domain expression for $v(t)$, $t > 0$, the voltage across L. This expression must not contain any complex numbers.