1. **YF 30.79**. Switch S is closed at time $t = 0$, causing a curent i_1 through the inductive branch and a current i_2 through the capacitive branch. The initial charge on the capacitor is zero, and the charge at time t is q_2.
   (a) Write the circuit equations using Kirchoff's laws.
   (b) What is the initial current through the inductive branch and the capacitative branch? What are the currents through the branches at $t = \infty$?
   (c) Write expressions for i_1, i_2, and q_2 as functions of time. Draw plots for each.
   (d) After a long time, the switch S is opened. Describe qualitatively what happens to the current through the circuit. What is the frequency of damped oscillations?
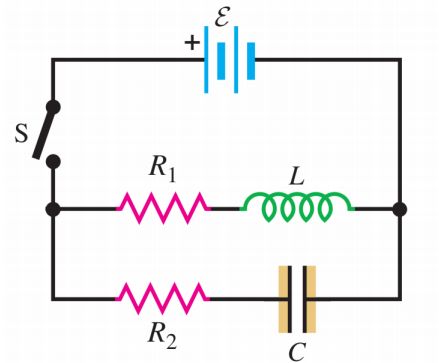
2. **RLC series.** Consider an RLC series circuit (where the elements are arranged in order $R \rightarrow L \rightarrow C$) with an alternating voltage source $v_s(t) = V_s cos(\omega t)$. Suppose that V_{out} denotes the voltage accross the capacitor.

   a) Determine the ratio V_{out}/V_S.

   b) Determine the leading order behavior of this ratio for $\omega \rightarrow 0$ and $\omega \rightarrow \infty$.

   c) Can you think of a way that these results can be used in real life?