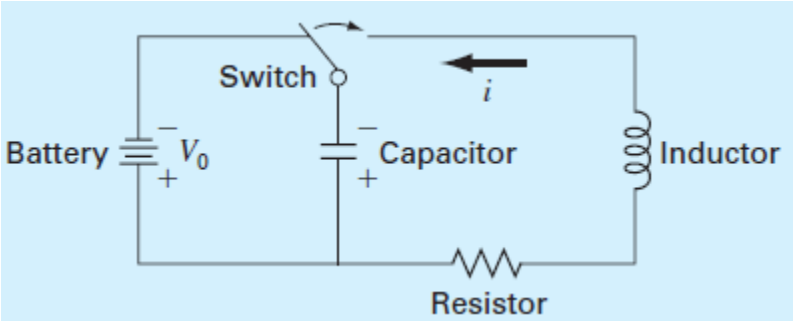
ME 2004: RLC Circuit

A simple electric circuit consisting of a resistor R (Ω), a capacitor C (F), and an inductor L (H) is depicted in the figure below:



(Chapra 2017)

After the switch is flipped, the charge on the capacitor $q(t)$ (in Coulombs, *C*) over time is:

$$q(t) = q_0 e^{-\frac{Rt}{2L}} \cos\left[\left(\sqrt{\frac{1}{LC} - \left(\frac{R}{2L}\right)^2}\right)t\right]$$

where:

- $q_0 = 10\ C =$ initial charge on the capacitor
- $R = 60\ \Omega =$ resistance
- $L = 9\ H =$ inductance
- $C = 5 * 10^{-5}\ F =$ capacitance

a) Construct a time vector ranging from 0 to 20 seconds.
b) Construct $q(t)$.
c) Create a 3x1 grid of subplots. Plot q vs t on all subplots. Set the upper x-axis limit to 0.2 seconds on the uppermost subplot and 2.0 seconds on the middle subplot (leave the bottommost subplot intact). Make sure to add axes labels to each subplot. Give the overall figure a descriptive title using the `sgtitle()` function (do not use the `title()` function).
d) Which subplot is the "best"? Why?