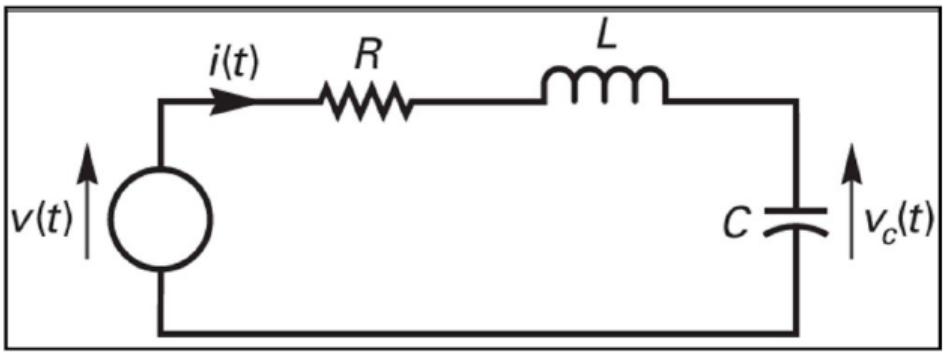
Homework Assignment 2 – Review of Laplace transform

1) Complete the proof of the convolution property for the Laplace transform
2) Consider the following circuit:



   a. Find the differential equation relating the input $v(t)$ to output $v_C(t)$.

   b. Defining the parameters: $\omega_0 = \frac{1}{\sqrt{LC}}$ and $\varsigma = \frac{R}{2}\sqrt{\frac{C}{L}}$ (the natural frequency and damping).

   Find the transfer function for this system in terms of ω_0 and ς

   Find the pole-zero map, impulse response, and step response for the following values of ω_0 and ς

   c. $\omega_0 = 4$ and ς=0.25

   d. $\omega_0 = 4$ and ς=0.025

   e. $\omega_0 = 8$ and ς=0.25

3) Consider the following transfer function: $X(s) = \frac{s+2}{(s+2)^2+1}$

   a. Find the corresponding differential equation.

   b. Find the pole-zero map, impulse response, and step response.