1. **Computing signal spectra.** Consider the signal $x(t)$ that you have seen in Problem 1 in the previous homework, namely the periodic extension of the function

$$s(t) = \begin{cases} 
-1 + \sqrt{-1}e^t, & -1 \leq t \leq 0 \\
1 - \sqrt{1}e^{-t}, & 0 < t \leq 1 
\end{cases}$$

Modify your MATLAB code from the last homework to compute and plot the amplitude and phase spectra of $x(t)$ up to the 15th harmonic ($-15\omega_0$ to $15\omega_0$).

2. **High-pass filter.** Consider the following circuit:

(a) Write down the input-output differential equation describing this system.
(b) Use your result from part (a) to find the frequency response $H(\omega)$ of this system.
(c) Sketch the amplitude response $|H(\omega)|$ and the phase response $\angle H(\omega)$.
(d) If an input $x(t)$ is given as a complex exponential Fourier series

$$x(t) = \sum_{k=-\infty}^{\infty} c_k e^{j\omega_0 t},$$

what is the largest number of frequency components (harmonics) of $x(t)$ whose squared amplitudes will be attenuated by a factor of $1/2$ or more?