Lab 3

EE 324: Signals and Systems II

In this Lab section we will continue our exercises on mathematical modeling of dynamical systems.

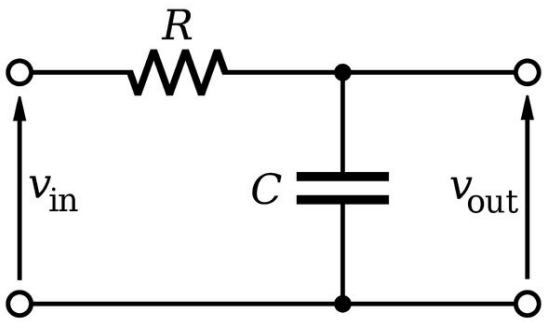
1 Prelab assignment

1. Get familiar with the differential equation solver ode45 again `https://www.mathworks.com/help/matlab/ref/ode45.html`
2. Simulate and plot the response of the following system

$$y[k] - 0.5y[k-1] = x[k]$$

with input $x[k] = 1$.
3. Derive the differential equation associated with the following systems

i) Input $x = v_{in}$, output $y = v_{out}$



2 Lab assignment

1. Compute the impulse response $h(t)$ of system (i).
2. Compute the response of system (i) with parameters $R = 500k\Omega, C = 1\mu F$, input $x = 1V$ and initial condition $y(0) = 0$. Plot it with the simulation result (using ode45) in the same figure.
3. Compute the response of system (i) with parameters $R = 500k\Omega, C = 1\mu F$, input $x = \sin(2\pi t)V$ and initial condition $y(0) = 0$. Plot it with the simulation result in the same figure.
3. Derive the impulse response of

$$y[k] - 0.5y[k-1] = x[k] \tag{1}$$

4. Compute the response of system (1) with input $x[k] = 0.8^k$. Plot it with the simulation result in the same figure.
5. Derive the impulse response of

$$y[k] - 1.3y[k-1] + 0.4y[k-2] = x[k] \tag{2}$$

6. Compute the response of system (2) with input $x[k] = 1$. Plot it with the simulation result in the same figure.