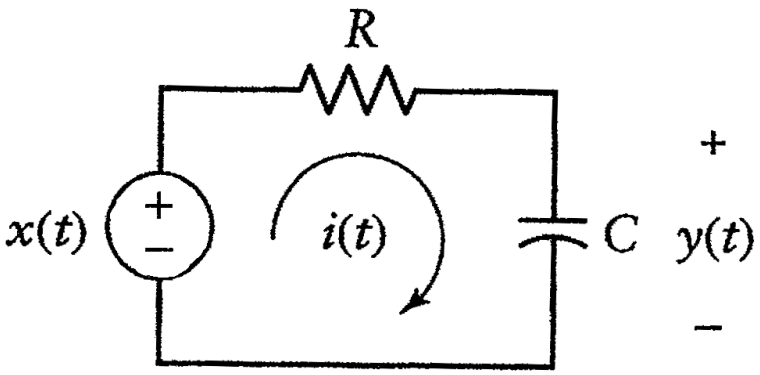
ELEC 309
Signals and Systems
Homework 3 Assignment

Time-Domain Analysis of LTI Systems



1. The RC-circuit above (with $R = 100$ kΩ and $C = 10\mu$F) is an LTI system with input signal $x(t)$, output signal $y(t)$, and impulse response given by

$$h(t) = e^{-t/RC}u(t).$$

(a) Using convolution, determine the voltage across the capacitor if $x(t) = u(t) - u(t-2)$.

(b) Using MATLAB, plot $y(t)$ from part (a).

2. The input-output relationship for the LTI system that is a four-point moving-average system is given by

$$y[n] = \frac{1}{4}\sum_{k=0}^{3} x[n-k].$$

(a) Determine the impulse response $h[n]$ of this LTI system.

(b) Using convolution, determine the response of the system when the input is the rectangular pulse given by

$$x[n] = u[n] - u[n-10].$$

(c) Using MATLAB, plot $y[n]$ from part (b).