Ex:

Write a Matlab function called \texttt{RCplot} that plots the voltage on a capacitor versus time. Specifically, \texttt{RCplot} does the following:

i) Accepts three input values: \texttt{Vzero}, \texttt{Vinf}, and \texttt{tau} representing the initial voltage on the capacitor, the final voltage on the capacitor, and the time constant in the standard formula for capacitor voltage: \( v_C = v_{\text{inf}} + (v_{\text{zero}} - v_{\text{inf}})e^{-t/\tau} \)

ii) Test whether \( \tau \) is negative and, if so, prints an error message and returns to the calling program.

iii) Creates an array called \texttt{t} containing time values from 0 to 1 ms (i.e., 0.001 sec) (inclusive) spaced by 1 \( \mu \)sec (i.e., \( 10^{-6} \) seconds).

iv) Creates an array called \texttt{vC} containing capacitor voltage for each time in array \texttt{t}. (Use the standard formula for \( v_C \), above.)

v) Plots \( v_C \) versus \( t \) as a blue line on an x-y plot.

vi) Labels the x-axis as "time", the y-axis as "voltage", and titles the plot "Capacitor Voltage".

\textbf{SOL'N:}

\begin{verbatim}
function RCplot(Vzero,Vinf,tau)
% RCplot(Vzero,Vinf,tau) Plots RC circuit voltage waveform.
% Inputs:
% Vzero = voltage at time zero
% Vinf = voltage at time approaching infinity
% tau = time constant of circuit

    % Test whether time constant is negative (not allowed).
    if tau < 0
        display('Error: time constant tau is negative--not allowed!')
        return
    end

    % Create a 1 msec time array, with samples spaced by 1 usec.
    t = 0:1e-6:1e-3;

    % Create array of voltages using standard RC solution.
    vC = Vinf + (Vzero - Vinf) * exp(-t/tau);

    % Plot vC versus time.
    plot(t,vC,'b-')

    % Add labels to plot.
    xlabel('time')
    ylabel('voltage')
    title('Capacitor Voltage')
\end{verbatim}