

MIT Subject 2.017

Lab 2 Worksheet – MATLAB Basics

Goals:

Learn how to simulate ordinary differential equations using Matlab;

Learn how to make and adjust graphs;

Learn how to employ user input and output;

Learn how to write and read files.

1. Using the *ode45* command, simulate the system $dx/dt = -3x$, from the initial condition $x(t=0) = 1$. The simulation time is two seconds. Make a plot of x versus time. Annotate your plot as necessary.
2. Simulate the second-order system $dx_1/dt = -a*x_1 - b*x_2$, $dx_2/dt = x_1$, using initial conditions $x_1(t=0) = 0$, $x_2(t=0) = 1$, and $a = 1$, $b = 1$. The simulation time is six seconds. Make a plot of x_1 and x_2 (overlaid) versus time.
3. Modify your code so that a user can type in any value for a and b .
4. Modify your code so that when a simulation occurs, it writes a text file of a given name with three columns: $[t, x_1, x_2]$. Be sure to give the user a choice as to whether or not to write the file.
5. Modify your code so that after you run the simulation and plot the results, any number of data files can be read in, to be plotted on top of the simulation results, using a different line type.

Your lab notebook should contain:

Lab Worksheet on the first page.

Print-out of the final code (Step 2 onwards), and plots.

Notes on the execution of your programs.

You have to show us the program operating in order to complete the lab.