ECE-210-A HW9

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In this (final) problem set, you will review the symbolic toolbox and create a simple app using the app designer.

1. Consider the system of differential equations:

$$\frac{dx}{dt} = y$$
$$\frac{dy}{dt} = -x - y$$

   Solve the system using the symbolic toolbox's `dsolve` function using four different initial conditions (so you should have four sets of solutions):

$$x(0) = -1,\ y(0) = 1$$
$$x(0) = 1,\ y(0) = 1$$
$$x(0) = -1,\ y(0) = -1$$
$$x(0) = 1,\ y(0) = -1$$

   Then plot all four parametric curves $(x(t), y(t))$ on the same plot on $t = [0\ 100]$ using `fplot`. This should generate four spirals. Use a legend.

2. Consider the following experiment: You roll M D-sided fair die, and count the sum of all the die values.

   You are going to build an app using `appdesigner` that displays a histogram of the resulting sums. There should be input boxes to control the simulation, a button to run the simulation, and a plot plane (`UIAxes`) to plot the histogram. You will need three input boxes: one for M, one for D, and one for the number of simulations to run, N. Make each bin width 1, and normalize the counts (see the histogram `"BinWidth"` and `"Normalization"` options). (You can assume that the input is valid.)

   For submission, export the app to a .m file by clicking "Save > Export to .m File," and make sure you can run it like you would a normal function. (E.g., if you export your app to `dice_sim.m`, you should be able to call it by running `dice_sim`.)

   (As M increases, the distribution becomes more normal – this is a demonstration of the Central Limit Theorem.)