

Math 23 Diff Eq: Homework 1

due Wed Sept 28 ... but best if do relevant questions after each lecture

Some of your homework time this week is devoted to getting started with Matlab, a versatile and powerful package which I promise will bring you joy and success in your future careers! For help, always start with our course website <http://math.dartmouth.edu/~m23f05>, then ask friends or myself.

- A. Install Matlab on your personal machine, *e.g.* from <http://hydra.dartmouth.edu/matlab/downloads>. Susan Schwarz can help with installation. Instead you could work at computer labs where Matlab is already installed. Try out a couple of commands from the Matlab introductions linked on our course site (don't worry about matrices yet). Try `t=-2:.01:2; y=exp(t); plot(t,y);`
- B. Exploring direction fields and solution families.
- Download `dfield7` to your desktop or working directory and run it from Matlab. (Failing that, use the Java version).
- Use it to plot the direction field superposed on some solutions to $y' = 3 - y$ with different initial conditions $y(0) = y_0$. Hand in printout of this.
- Describe in words the relationship between the direction field and a solution passing through a given point (t, y) .
 - Describe the behavior as $t \rightarrow \infty$ (unstable, growth/decay, etc). Does it depend on y_0 ?

Problems from Boyce & DiPrima: (remember to show your working/reasoning—answers without explanation will not receive a high score!)

1.1: 2, 20 (don't use computer), 22.

1.2: 7, 12.

1.3: 1, 9, 16.

2.1: 1 [Hint: in `dfield7` you will want to enter `y' = -3*t + t + exp(-2*t)`], 15, 20.

2.2: 2, 6 (look for constant solutions too), 21 (convert the y values where y' goes undefined to x values. Finally use `dfield7` to visualize integral curve—you may need to `Stop` the solver yourself for each curve).

2.4: 1 (linear or nonlinear?), 8 (easy).