

Numerical ODE HW 1

1. Use a prebuilt ODE solver in any programming environment matlab, Mathematica, the GNU Scientific Library, MathCad, etc. to recreate figure 120 in the text by numerically solving and plotting a numerical solution of an ODE.
2. Repeat question one in a different programming environment.
3. Calculus texts (in the current MTU text it is section 11.3) describe Euler's method for numerically approximating solutions of initial value problems. For $y' = y^2$ with $y(0)=1$.
 - 3.1. Plot an analytical solution on an appropriate domain.
 - 3.2. Use Euler's method with stepsize $h = 0.1$ to create a table of approximate solutions on the domain $0 \leq x \leq 1$. Include the values and a plot comparing the approximate and analytical solutions.
 - 3.3. Use a number of different step sizes to examine the dependence of the Euler approximation to $y(0.5)$ on the step size. Include a plot showing the dependence of the error on the stepsize.
4. The generic ODE solver looks something like the following flow chart. Think about how to organize your computer program so that you can easily change various components. There is nothing to write down here. Just think about it.

Generic ODE Solver

