

ASTR 5540 Math Meth Fall 2008. Problem Set 2. Due Mon Sep 8

1. Numerical Integrator

(a) Code

Write a code to integrate a set of differential equations

$$\frac{dy_i}{dx} = f_i(x, \mathbf{y}) \quad i = 1, \dots, n \quad (1.1)$$

from specified initial conditions x_0, \mathbf{y}_0 . Your code should accept as argument the name of a subroutine that computes the derivatives $f_i(x, \mathbf{y})$.

You are free to program in the language of your choice, and you may choose whatever numerical algorithm you prefer. The default choices are the c language, and the 4th-order Runge-Kutta algorithm, templates for which can be downloaded from the class website at http://casa.colorado.edu/~ajsh/ast5540_08/prob.html.

(b) Test

Test your code by integrating

$$\frac{dy}{dx} = -y . \quad (1.2)$$

Try varying the step size. Compare the results of your numerical integration to the analytic solution.