

Math 582 B  
Homework 3  
Corrected April 28, 2007

1. Page 115, Exercise 4.12
2. Plot the boundary of the region of stability for the Adams-Bashforth  $k = 3$  method. (See table 5.1 and figure 5.5 of the text).
3. Page 153, Exercise 5.2. For part (a) use the method of example 5.6 of the text (page 138).
4. Page 154, Exercise 5.5. You should interpret the phrase “Using a software package of your choice” as “use the Mathematica function NDSolve” and ignore the error tolerance. For part (c) instead of changing the error tolerance, change the initial conditions from  $(0, 1, 0)^T$  to  $(0, 1, 10^{-6})$  and compare the two plots of  $y_2$  vs  $t$ .
5. Page 186, Exercise 7.1 (a). Hint: See Example 7.1 of the text, page 178.
6. Use the Method of Steps (Chapter 8 of the Notes) to solve

$$y'(t) = -t y(t - \tau)$$

on the interval  $[0, 5]$ , using  $\tau = 1$ , for each of the following initial conditions on  $-1 < t < 0$ :  $g(t) = 0$ ,  $g(t) = 1$ ,  $g(t) = t - 1$ , and  $g(t) = e^{-t}$ . Show both the analytic solution and a plot of the solution. Hint: You should be able to complete this entire problem using Mathematica. The analytic solution will be extremely tedious if you attempt to do it by hand.