

Numerical Methods for the Solution of Differential Equations (AM 213B)

Homework 4 - Grading rubric

Question 1 (20 points):

- (a) 10 points for determining the correct local truncation error and conclude that the method is consistent with order 1 in time and order 2 in space. 3 points of partial credit if there is relevant work but the answer is incorrect.
- (b) 10 points for correct Von-Neumann stability conditions and analysis. 3 points of partial credit if there is relevant work but the answer is incorrect.

Question 2 (30 points):

- (a) 10 points for proving the integral of the solution is constant in time and equal to one, thus proving mass conservation. 3 points of partial credit if there is relevant work but the answer is incorrect.
- (b) 15 points for producing the correct numerical solution using the method of characteristics, and 5 points for producing the correct 2D contour plots. 5 points of partial credit if you developed code and simulations but the result are not not fully correct.

Question 3 (50 points):

- 1. 15 points for producing the correct numerical solution using the finite difference method; 5 points for producing the correct 2D contour plots. 5 points of partial credit if the code you developed runs but does not produce the correct plots.
- 2. 10 points for plotting the correct dynamics of the integral versus time.
- 3. 10 points for plotting the correct maximum pointwise error versus time. 5 points of partial credit if the numerical solution using the finite difference or the method of characteristics is incorrect correct but the implementation of the maximum point-wise error and plotting code is correct.
- 4. 10 points for plotting the correct mean squared error versus time and state that the mean squared error decreases quadratically with N . 5 points of partial credit if the numerical solution using the finite difference or the method of characteristics is incorrect correct but the computation of the mean squared error and plotting code is correct.