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

Homework 3 - grading form

Name: Dante Buhl

Final score: write your final score here, for instance, 93/100.

Point allocation explanation

Question 1 (40/40 points): The code correctly computes the solution using a Linear Solve function from Lapack. Both plots produced match those shown in the solution.

Question 2 (57/60 points): The analytical solution produced matched that in the solutions. The only distinction is the differnce in how the sin term is written but they are equivalent. The produced plot of the analytical solution matches. Finite Difference method produces the same solution. Gauss-Chebyshev-Lobatto method produces the same solution. The error plot for the Finite Difference Method matches. The plot for the spectral method is very similar however not exactly the same. Partial credit is given here since the plot has very similar features and resembles the plot in the solutions except for the bump back to 10^{-6}.

Extra Credit Question (30/30 points): I would like to petition for more points in this section. What I submitted did not produce the correct solution so there was no use in submitting anything at the time. Howver, going back through the code, I noticed that there was an error in the Δt value I passed to the routine. It was 10 times larger than it was supposed to be and this caused the AB2 method to become unstable and blow up. After I fixed this issue, I tested the code and obtained the correct result. I have attached the plots that my code now produces here, so that they may be considered. I believe I deserve full credit for this portion of the assignment, but if you do not agree I will be happy with the 10 points of partial credit for having a numerical algorithm but it not working properly.

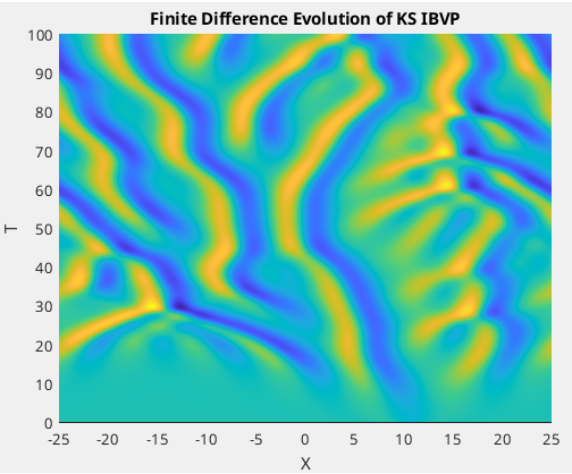

Figure 1: 2D Colormap of Numerical Solution to (3)

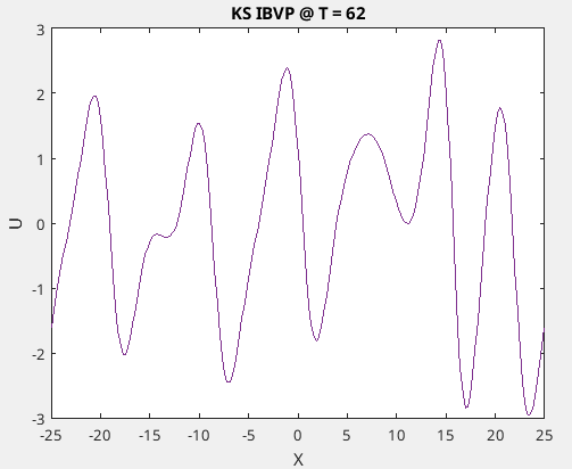

Figure 2: Cross Section of Numerical Solution to (3) at T = 62