

MST 352/652
Term Paper: Finite Difference Schemes for the Advection
Equation

Due Date: May 06, 2019

The goal of this project is to understand how to numerically solve the advection equation. While it may seem a straight forward to apply a finite scheme, the fact that the sign of the wave of the speed can change sign means that different numerical solvers may be unstable. In particular, the choice of the correct numerical solver must be chosen from some analysis of the underlying PDE. The goal of this term paper is to learn about different numerical solvers, their stability properties, and apply these techniques for sample problems.

Your term paper should give a recap of the section(s) you read from the text as well as the solutions to the required problems. Some of the key concepts are given below as well as the relevant sections from the text and homework problems.

1. **Textbook Sections:** pg. 195: Numerical Algorithms for First-Order Partial Differential Equations
2. **Key Concepts:** Finite differences, CFL condition, von-Neumann analysis, upwind and Lax-Wendroff schemes.
3. **Problems:** #5.3.1-5.3.10.