

Introduction to Week Six

Numerical Solutions of PDEs

Direct Solution of Boundary Value Problems

Iterative Solution of Boundary Value Problems

Time-stepping Methods for Initial Value Problems

- ✓

Video: Explicit Methods for Solving the Diffusion Equation | Lecture 69
13 min
- ✓

Reading: Using a Second-Order Time-Stepping Method
10 min
- ✓

Reading: FTCS Scheme for the Advection Equation
10 min
- ✓

Video: Von Neumann Stability Analysis of the FTCS Scheme | Lecture 70
14 min
- ✓

Reading: Von Neumann Stability Analysis of the FTCS Scheme for the Advection Equation
10 min
- ✓

Video: Implicit Methods for Solving the Diffusion Equation | Lecture 71
8 min
- ✓

Reading: Implicit Discrete Advection Equation
10 min
- ▶

Video: Crank-Nicolson Method for the Diffusion Equation | Lecture 72
13 min
- ⌕

Reading: Lax Scheme for the Advection Equation
10 min
- ▶

Video: MATLAB Solution of the Diffusion Equation | Lecture 73
11 min
- ⌕

Reading: Difference Approximations for the Derivative at Boundary Points
1 min
- 🔗

Ungraded External Tool: The Diffusion Equation with No-Flux Boundary Conditions
30 min

Quiz

Programming Assignment: Two-dimensional Diffusion Equation

Farewell

Implicit Discrete Advection Equation

Consider the one-dimensional advection equation given by

$$\frac{\partial u}{\partial t} = -c \frac{\partial u}{\partial x}.$$

- (a) By computing the spatial derivative at the advanced time step t_{l+1} , derive the implicit discrete advection equation.
- (b) Analyze its stability.

✓ Completed

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