
MATH 448/548 - Numerical Analysis

Homework assignment 4 (optional)

Date assigned: April 19, 2008

Due date: **May 2, 2008**

- Include a cover page and *this* problem sheet

PROBLEMS:

1. [10 points] Find the stability condition for forward-time backward-space scheme for 1D advection equation.
2. [10 points] Show that for the explicit Lax-Wendroff scheme for 1D advection equation the magnitude of amplification factor is

$$|\lambda|^2 = 1 - 4R^2 \sin^4(k/2) + 4R^4 \sin^4(k/2)$$

and the stability condition is

$$\frac{|a|\Delta t}{\Delta x} \leq 1.$$

3. [15 points] Prove that explicit centered in space scheme for 1D advection equation is unstable.
4. [15 points] Show that implicit centered in space scheme for 1D advection equation is unconditionally stable.