

Chapter 1

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1.1 2

1.1.1 问题

在初始条件

$$f_j = \begin{cases} x_j & 0 \leq x \leq \pi \\ 2\pi - x_j & \pi \leq x \leq 2\pi \end{cases}$$

下, 使用 Forward-Euler, Lax-Friedrichs, Lax-Wendroff 方法数值求解

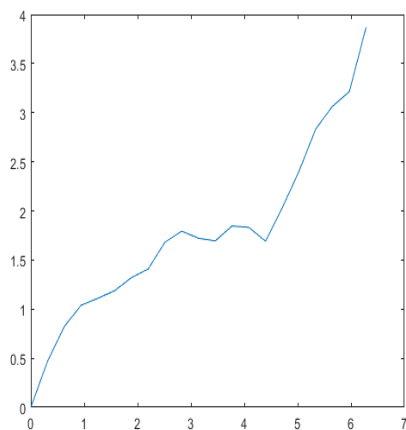
$$u_t = u_x$$

1.1.2 准确解

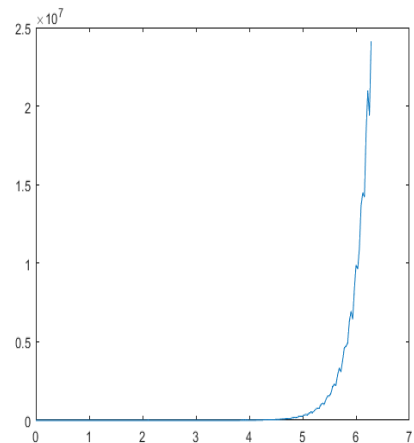
使用 $h = 2 * \pi / 5000, k = h/2$ Lax-Wendroff 方法的数值模拟结果作为精确解.

1.1.3 Forward-Euler

$h = 2\pi/10, 2\pi/100, k = h/2$ 的结果都 explosion, 如下图



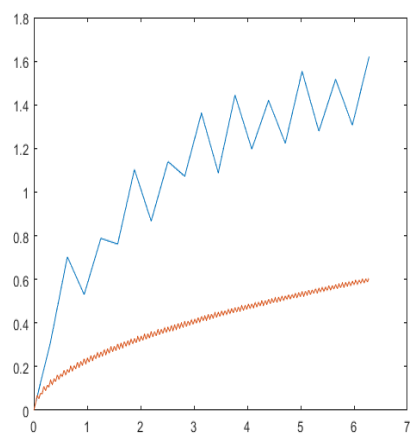
(a) $h = 2\pi/10$



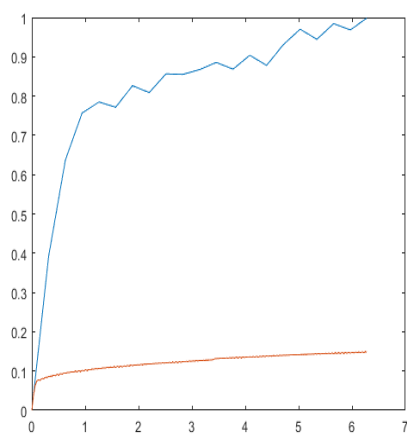
(b) $h = 2\pi/100$

1.1.4 Lax-Friedrichs 和 Lax-Wendroff

结果没有 explosion, h 更小时误差收敛到更小, Lax-Wendroff 效果更好一点.



(c) Lax-Friedrichs



(d) Lax-Wendroff