

HW2

April 11, 2009

1. Solve $u_t + u_x = 0$ at $t = 2, 4, 6, 8$, $-1 \leq x \leq 1$, periodic boundary conditions, with initial data:

$$u(x, 0) = \sin(\pi x)$$

- (a) 1st Order Upwind
- (b) 1st Order Downwind
- (c) central in space and forward in time
- (d) Lax-Friedrichs
- (e) 2st Order Upwind
- (f) Lax-Wendroff
- (g) ENO

2. Solve $u_t + u_x = 0$ at $t = 0.2, 0.4, 0.6, 0.8$, $-1 \leq x \leq 1$, $u(1, t) = -1$ and $u(-1, t) = 1$, with initial data:

$$u(x, 0) = \begin{cases} -1 & \text{for } x \geq 0 \\ 1 & \text{for } x < 0 \end{cases}$$

- (a) 1st Order Upwind
- (b) 1st Order Downwind
- (c) central in space and forward in time
- (d) Lax-Friedrichs
- (e) 2st Order Upwind
- (f) Lax-Wendroff
- (g) ENO

Choose dt and dx you like to show order of accuracy if the scheme does converge.

3. Ex 3.1-3.5 in the book