HW8

May 16, 2007

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

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

(b) u(1,t) = -1 and u(-1,t) = 1, with initial data:

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

(c) periodic boundary conditions, with initial data:

$$u(x,0) = \left\{ \begin{array}{cc} -x\sin(\frac{3}{2}\pi x^2) & -1 \le x \le -\frac{1}{3} \\ |\sin(2\pi x)| & |x| \le \frac{1}{3} \\ 2x - 1 - \sin(\frac{3\pi x}{6}) & \frac{1}{3} \le x < 1 \end{array} \right\}$$

by the following schemes:

- (i) 2nd order TVD with superbee limiter (16.14) & (16.27)
- (ii) 2nd order TVD with van Leer limiter (16.14) & (16.28)
- (iii) 2nd order TVD with minmod slope (16.46) & (16.51)