

## Numerical Methods for Conservation Laws

### Assignment 1 (Scalar Laws)

Use the fluctuation/ flux difference splitting algorithm in (i) first-order upwind (ii) second-order central form to numerically solve for scalar hyperbolic conservation laws given below with initial data

$$u(x, 0) = 2, \quad |x| < 1/3 \quad (1)$$

$$u(x, 0) = 1, \quad \textit{elsewhere} \quad (2)$$

in the domain  $[-1, 1]$  and periodic boundary conditions. Discretize domain both with 40 and 80 points and use  $\frac{\Delta t}{\Delta x} = 0.8$ .

1.  $u_t + u_x = 0$ ,  
plot  $u(x, 0), u(x, 2), u(x, 4)$ .
2.  $u_t + (u^2/2)_x = 0$ ,  
plot  $u(x, 0.3)$ .
3.  $u_t + [u(1 - u)]_x = 0$ ,  
plot  $u(x, 0.3)$ .