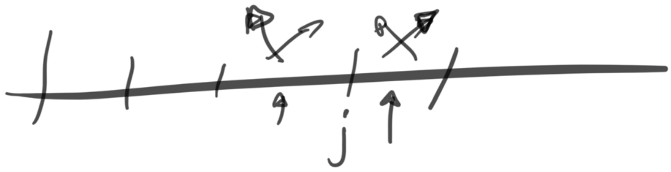
$$u_j^{n+1} = u_j^n - \frac{k}{h} \begin{cases} f_j^n - f_{j-1}^n & , \nu_{j-\frac12}^n > 0 \\ f_{j+1}^n - f_j^n & , \nu_{j+\frac12}^n < 0 \\ \text{either of above if } \nu_{j-\frac12}^n > 0 \text{ and } \nu_{j+\frac12}^n < 0 \\ 0 \text{ if } \nu_{j-\frac12}^n < 0 \text{ and } \nu_{j+\frac12}^n > 0 \end{cases}$$



Note: the nonlinearity causes no essential difficulty in computation for such explicit scheme.

Lax-Wendroff:

$$u_{tt} = -(f_x)_t = -(f_t)_x = -(f'(u)u_t)_x$$
$$= (f'(u) f_x)_x$$

so Lax-Wendroff for $u_t + f_x = 0$ becomes

$$u_j^{n+1} = u_j^n - \frac{1}{2}\frac{k}{h}(f_{j+1}^n - f_{j-1}^n)$$
$$+ \frac{1}{2}\frac{k}{h}\left[\nu_{j+\frac12}^n (f_{j+1}^n - f_j^n) - \nu_{j-\frac12}^n (f_j^n - f_{j-1}^n)\right]$$

which can be written as the 2 stage process

$$u_{j+\frac12}^{n+\frac12} = \frac12 (u_{j+1}^n + u_j^n) - \frac12 \frac{k}{h}(f_{j+1}^n - f_j^n)$$

'Predictor'

followed by

$$u_j^{n+1} = u_j^n - \frac{k}{h}\left(f_{j+\frac12}^{n+\frac12} - f_{j-\frac12}^{n+\frac12}\right)$$

which requires no explicit evaluation of ν, a