Errata for "Numerical Time-Dependent Partial Differential Equations for Scientists and Engineers"

June 6, 2012

The following lists all known corrections to the *"Numerical Time-Dependent Partial Differential Equations for Scientists and Engineers"* book by M. Brio, A.R. Zakharian and G.M. Webb (first edition, Elsevier Inc., 2010).

Chapter 2.1. Polynomial Interpolation and Finite Differences

p. 68, last formula should read: $\frac{u_{ij}^{n+1}-u_{ij}^{n}}{\Delta t} = \frac{3}{2}P(u_{ij}^{n}) - \frac{1}{2}P(u_{ij}^{n-1})$

p. 73, formula (2.16) should read: $e^z \approx \frac{1+z/2}{1-z/2} + O(z^3)$

p. 73, after formula (2.17) it should read "... minimizes the maximum error ..." instead of "... minimizes minimum, maximum error ..."

Chapter 2.2. Compact Finite Differences and Dispersion Preserving Schemes

p. 79, formula "$\theta \approx \arcsin(\theta) + \frac{b}{2}\sin(2\theta) + ...$" should read: "$\theta \approx a\sin(\theta) + \frac{b}{2}\sin(2\theta) + ...$"

Chapter 2.4. Method of Weighted Residuals

p. 95, formula (2.77) should read: $u_N(0, x_i) = c_i(0) = u_i$

Chapter 3.2. Lax-Richtmyer Equivalence Theorem

p. 130, formula (3.78) should read:

$$p \sim \log_2 \frac{||U(\Delta x) - U(\frac{\Delta x}{2})||}{||U(\frac{\Delta x}{2}) - U(\frac{\Delta x}{4})||}$$

Chapter 3.3. Von Neumann Analysis and CFL Necessary Stability Condition

p. 131, in the paragraph following formula (3.80) $|r| = e^{-Im(\omega)\Delta t}$ should read: $|r| = e^{+Im(\omega)\Delta t}$

Chapter 4.1. Introduction to Numerical Boundary and Interface Conditions

p. 146, at the bottom of the page "... boundary condition at x=1 ..." should read: "... boundary condition at x=0 ..."

p. 146, last line should read: "... (stable and first-order accurate)."

Chapter 4.2. Transparent Boundary Conditions ...

p. 149, the second and third formulas on the bottom half of the page should read:

$$\sqrt{1-\tilde{k}_2^2} \approx 1 - \frac{1}{2}\tilde{k}_2^2, \quad 2u_{tt} + 2u_{xt} + u_{yy} = 0,$$

$$\sqrt{1-\tilde{k}_2^2} \approx \frac{1}{1+\frac{1}{2}\tilde{k}_2^2}, \quad 2u_{ttt} + 2u_{xtt} + u_{xyy} = 0$$

p. 150, on the first line ($k_t = 0$) should read: ($\tilde{k}_t = 0$)

p. 153, at the end of the second paragraph $r = (p_2 - p_1)/p_1$ should read: $r = (P_2 - P_1)/P_1$

Chapter 4.3. Berenger's PML Boundary Condition

p. 163, the first line of formula (4.41) for η_2 should read:

$$\eta_2 = Z_2 \left(\frac{1 + i\sigma_{mx}/\omega\mu_2}{1 + i\sigma_x/\omega_2\epsilon_2} \right)^{1/2}$$

Chapter 5.1. Examples of Weakly and Strongly Interacting Multiple Scales

p. 177, both formulas at the top of the page should read: $\lambda = -\frac{1}{\epsilon}$

p. 177-178, $\exp\theta$ should read $\exp(\theta)$

Chapter 5.3. Long-Time integrators for Hamiltonian Systems

p. 207, the formula $H = \frac{1}{2}U^t DU + \frac{1}{2}V^t DV$ should read: $H = \frac{1}{2}U^t CU + \frac{1}{2}V^t CV$

Chapter 5.5. Methods of Fractional Steps, ...

p. 245, in the second equation "$u + uu_x = 0$, ... " should read: "$u_t + uu_x = 0$, ... "

Chapter 6.2. Adaptive and Moving Grids ...

p. 257, in the second formula the term $\alpha|\Delta f|^2$ should read: $\alpha_2|\Delta f|^2$