Errata

Chapter 1

p.2 "Also this book also tries…" should read "Also this book tries…"

p. 4 "Taken on balance, unless you need immediately useful solutions for a limited class of simple problems, the steady one-dimensional problem proves far more fruitful than the unsteady two dimensional problem." This should read as follows: "Taken on balance, unless you need immediately useful solutions for a limited class of simple problems, the *unsteady* one-dimensional problem proves far more fruitful than the *steady* two dimensional problem."

Chapter 2

p. 19 The definition of the critical speed of sound in problem 2.6 should read as follows:

$$a^{*2} = \frac{2(\gamma - 1)}{\gamma + 1}\left[\frac{1}{2}u_a^2 + \frac{1}{\gamma - 1}a_a^2\right] = \frac{2(\gamma - 1)}{\gamma + 1}\left[\frac{1}{2}u_b^2 + \frac{1}{\gamma - 1}a_b^2\right]$$

p. 20 $\frac{\partial \mathbf{u}}{\partial t} + \frac{\partial \mathbf{f}}{\partial x} = 0$ should read $\frac{\partial \mathbf{u}}{\partial t} + \frac{\partial \mathbf{f}}{\partial m} = 0$

Chapter 3

p. 34. Equation (3.31) should read as follows:

$$r_{C2} = (const.)\begin{bmatrix} \rho/a \\ 1 \\ \rho a \end{bmatrix}$$

Similarly, Equation (3.33) should read as follows:

$$r_{C3} = (const.)\begin{bmatrix} -\rho/a \\ 1 \\ -\rho a \end{bmatrix}$$

Chapter 4

p. 64 $F(u) = 2u\,df/du$ should read $dF/du = 2u\,df/du$

Chapter 5

p. 74 "However, attempts to solve Equation (5.6) may fail if the quantity in square brackets is negative…" should read "However, attempts to solve Equation (5.6) may fail if the quantity in curly brackets is negative…"

p. 81 $\Lambda = Q\Lambda Q^{-1}$ should read $A = Q\Lambda Q^{-1}$

p. 85 In equation (5.40), $h_{RL_T} - (\gamma - 1)u_{RL}^2$ should read $h_{RL} - (\gamma - 1)u_{RL}^2$

p. 87 "For any flow variable ν…" should read "For any flow variable υ"

p. 87 $\frac{\sqrt{\rho_R}v_R + \sqrt{\rho_R}\rho_L}{\sqrt{\rho_R} + \sqrt{\rho_L}}$ should read $\frac{\sqrt{\rho_R}v_R + \sqrt{\rho_L}v_L}{\sqrt{\rho_R} + \sqrt{\rho_L}}$

p. 91 $S = \lambda$ should read $S = \lambda_i$

p. 91 The sentence in Example 5.2 should read as follows: "The first wave has speed -304.6 m/s and strength 546.6 m/s; the second wave has speed 60.8 m/s and strength -0.2011 kg/m^3; the third wave has speed 426.3 m/s and strength -846.6 m/s."

Chapter 6

p. 113 "Multiply the last two approximations to obtain…" should read "Multiply the two approximations to obtain…"

Chapter 9

p. 164 The second of three equations at the end of Step 3 should read as follows:

$d_{k0} = (x_i - x_{l_{n+1}(i)+k-1})d_{k-1,0}$. In other words, replace the *j* that appears in this equation by *i*.

p. 169. Equation (9.40) should read as follows:

$$\frac{1}{2}(S_{i+1} - S_{i-1})\Delta x_i d_i^2 + \left(\bar{f}_{i+1} - \bar{f}_{i-1} - \frac{3S_{i+1} - S_{i-1}}{2}\Delta x_i \right) d_i + S_{i+1}\Delta x_i - (\bar{f}_{i+1} - \bar{f}_i) = 0$$

Chapter 11

p. 189 $\bar{u}_i^{n+1} = u_i^n - \lambda(\hat{f}_{i+1/2}^n - \hat{f}_{i-1/2}^n)$ should read $\bar{u}_i^{n+1} = \bar{u}_i^n - \lambda(\hat{f}_{i+1/2}^n - \hat{f}_{i-1/2}^n)$

p. 196 The equation $f(u(x_{i+1/2}, t)) = f(u(x_{i+1}, t^{n+1})) + O(\Delta t)$ should read $f(u(x_{i+1/2}, t)) = f(u(x_{i+1/2}, t^{n+1})) + O(\Delta t)$. In other words, replace the subscript "i+1" by "i+1/2."

Chapter 12

p. 214 "Courant-Friedrichs-Lewyor (CFL) condition" should read "Courant-Friedrichs-Lewy (CFL) condition"

Chapter 13

p. 233 $\frac{\partial}{\partial x}(\min(0,u)u) \approx \frac{\min(0,u_{i+1}^n)u_{i+1}^n - \max(0,u_i^n)u_i^n}{\Delta x}$ should read

$$\frac{\partial}{\partial x}(\min(0,u)u) \approx \frac{\min(0,u_{i+1}^n)u_{i+1}^n - \min(0,u_i^n)u_i^n}{\Delta x}$$

p. 235 $x = mx_i$ should read $x = x_i$

p. 245 $p_e^{n+1}(x) = p_r(x_{i+1/2} - a\Delta t)$ should read $p_e^{n+1}(x) = p_r(x - a\Delta t)$

Chapter 15

p. 259 In the middle of the page, $u_{i\pm1}^n = \sum_{m=-N/2}^{N/2} C_m^n \exp\left(\frac{2\pi I mi(i\pm1)}{N}\right)$ should read $u_{i\pm1}^n = \sum_{m=-N/2}^{N/2} C_m^n \exp\left(\frac{2\pi I m(i\pm1)}{N}\right)$ (omit the extra i after the m).

Chapter 16

p. 285 "However, this is undesirable in *circumstance* where TVD is too strong…" should read "However, this is undesirable in *circumstances* where TVD is too strong…"

Chapter 17

p. 337 Near the end of the first long paragraph, near the middle of the page, $df^+/du \le 0$ should read $df^+/du \ge 0$.

Chapter 18

p. 353 Replace 8.02 x 10^{-3} by 8.02 x 10^{-4}

p. 406 $\hat{f}_{i+1/2}^n = \mathbf{f}(\mathbf{u}_i^n)$ should read $\hat{\mathbf{f}}_{i+1/2}^n = \mathbf{f}(\mathbf{u}_i^n)$

p. 410 $\hat{f}_{i+1/2}^n$ should read $\hat{\mathbf{f}}_{i+1/2}^n$

p. 420 All of the a's in the two unnumbered equations should be λ's, in keeping with the book's standard notation for characteristic values.

p 429 In problem 18.9.b, $\left|\mathbf{u}_{i+1}^n\right|$ should read $\left|u_{i+1}^n\right|$.

Chapter 19

p. 437 The last equation, preceded by "similarly, a third-order accurate approximation says" should read as follows:

$$\frac{\partial \rho}{\partial x} \approx \frac{-\rho_2^n + 27\rho_1^n - 27\rho_0^n + \rho_{-1}^n}{24\Delta x} = 0$$

Chapter 20

p. 460 $r_i^- = (u_i^n - u_{i-1}^n)(u_{i+1}^n - u_i^n)/\delta$ should read $r_i^- = sign(u_i^n - u_{i-1}^n)(u_{i+1}^n - u_i^n)/\delta$

p. 464 “Equation (22.10)” should read “Equation (20.10)”

p. 487 The second instance of $a(u) > 0$ should read $a(u) < 0$

p. 494-495. The denominator in Equations (20.71) and (20.72) should be squared. In particular, Equation (20.71) should read as follows:

$$r_i^+ = (\mathbf{u}_i^n - \mathbf{u}_{i-1}^n) \bullet \frac{(\mathbf{u}_{i+1}^n - \mathbf{u}_i^n)}{\left\| \mathbf{u}_{i+1}^n - \mathbf{u}_i^n \right\|^2}$$

and Equation (20.72) should read as follows:

$$r_i^- = (\mathbf{u}_{i+1}^n - \mathbf{u}_i^n) \bullet \frac{(\mathbf{u}_i^n - \mathbf{u}_{i-1}^n)}{\left\| \mathbf{u}_i^n - \mathbf{u}_{i-1}^n \right\|^2}$$

p. 505 (20,66) should read (20.66)

p. 525 $\hat{f}_s^n[x_{i-1/2}, x_{i+1/2}]$ in Step 1 should read $\hat{F}_s^n[x_{i-1/2}, x_{i+1/2}]$

p. 526 $\hat{F}_s^n[x_{l_i(i+1/2)}, x_{l_1(i+1/2)+1}]$ in Example 21.1 should read $\hat{F}_s^n[x_{l_1(i+1/2)}, x_{l_1(i+1/2)+1}]$ (subscript on *l* should be 1 instead of *i*).

p. 529 Equation (21.41) should read $\alpha_{i+1/2}^n = \max\left(\left| f'(u_{i+1}^n) \right|, \left| f'(u_i^n) \right| \right)$ instead of $\alpha_{i+1/2}^n = \max\left(\left| f'(u_{i+1}^n) \right|, f'(\left| u_i^n \right|) \right)$ (in other words, the absolute value applies to the function and not its argument)

Chapter 21

p. 512 The right hand side of Equation (21.13b) should read $\frac{1}{8}\phi_{i+1/2}^n(\bar{u}_{i+1}^n - \bar{u}_i^n)$. In other words, remove the factor of λ.

Chapter 22

p. 554 “Numerical results using this time-stepping scheme indicate that Jameson’s method with $\kappa = 1/2$ and $\delta = 1/4$ does not blow up for $\lambda \mid a(u) \mid \leq 1.1$” should read “Numerical results using this time-stepping scheme indicate that Jameson’s method with $\kappa = 1$ and $\delta = 1/4$ does not blow up for $\lambda \mid a(u) \mid \leq 1.1$”

p. 554 “From one point of view, Jameson’s method uses wider stencils to increase order of accuracy, whereas the Shu-Osher method uses wider stencils to increase stability” should read “From one point of view, the Shu-Osher method uses wider stencils to increase order of accuracy, whereas Jameson’s method uses wider stencils to increase stability.”

Chapter 23

p. 572 $\left| \bar{u}_{i+1}^n - \bar{u}_i \right| > 3 \left| \bar{u}_i^n - \bar{u}_{i-1}^n \right|$ should read $\left| \bar{u}_{i+1}^n - \bar{u}_i^n \right| > 3 \left| \bar{u}_i^n - \bar{u}_{i-1}^n \right|$

p. 581 Equation (23.41) should read $\bar{u}_{i+1}^n - \frac{1}{3}(\bar{u}_{i+1}^n - \bar{u}_i^n) - \frac{1}{6}(\bar{u}_{i+2}^n - \bar{u}_{i+1}^n)$

pp. 581-582. The 2's in the denominators should all be 4's. More specifically, $\frac{1+\eta}{2}$ should be $\frac{1+\eta}{4}$ and $\frac{1-\eta}{2}$ should be $\frac{1-\eta}{4}$ in equations (23.43), (23.44), and (23.47).

pp. 589. The 1/3 in equation (23.61) should be 1/6.

p. 590 Replace $\bar{u}_i^n - \frac{\Delta x^2}{24}$ by $\bar{u}_i^n - \frac{\Delta x^2}{24} C_i^n$ in equations (23.67), (23.68), and the two unnumbered equations that follow.

p. 590 In equations (23.67) and (23.68), replace C_j^n by C_i^n

p. 591 Replace C_i by C_i^n in the second and third unnumbered equations. Similarly, replace C_{i+1} by C_{i+1}^n.

p. 592 $u(x,t^n) = Qv(x,t^n)$ should read $\mathbf{u}(x,t^n) = Q\mathbf{v}(x,t^n)$

Index

p. 609 The entry "nodes, *see also* samples" should read "sodes. *See* samples."

p. 613 The entry "van Leer's reconstruction-evolution method" should include pages 505-514.