

ERRATA

This is the new errata sheet for both hardbound and softcover editions of the text, as of 9/3/07. Errata that apply only to the hardbound edition are followed by “(H)” and those that apply to both are followed by “(H/S)”.

Chapter 1:

- (1) p. 10, Definition 1.3 of $A \cap B$: Change “or” to “and”. (H/S)
- (2) p. 12, Figure 1.4: Should have $a + bi = re^{i\theta}$ and $a - bi = e^{-i\theta}$. (H/S)
- (3) p. 13, line -6: Replace “last” by “fifth”. (H/S)
- (4) p. 14, line 2: Replace “ $i(x_1y_2 - x_2y_1)$ ” by “ $i(x_1y_2 + x_2y_1)$ ”. (H/S)
- (5) p. 18, Example 1.14: In the solution replace “ $-1 \pm i\frac{\sqrt{3}}{2}$ ” by “ $-\frac{1}{2} \pm i\frac{\sqrt{3}}{2}$ ”. (H/S)
- (6) p. 19, Exercise 1.2.3(g): Answer should be $1e^{0i}$. (H/S)
- (7) p. 20, Exercise 1.2.10(b): Problem should be $(2 + 4i) - (3 - i)$. (H/S)
- (8) p. 30, Exercise 1.3.4(c): First equation should be $x_1 + x_2 = 1$. (H/S)
- (9) p. 31, Exercise 1.3.13(c): Answer should be augmented matrix with three right-hand sides reduces to $\begin{bmatrix} 1 & 0 & 2 & -1 & 1 \\ 0 & 1 & 1 & -1 & -1 \end{bmatrix}$ giving solutions (a) $x_1 = 2, x_2 = 1$ (b) $x_1 = -1, x_2 = -1$ (c) $x_1 = 1, x_2 = -1$. (H/S)
- (10) p. 42, Exercise 1.4.1(a),(g): Answer should be that leading entries are (a) (1, 2) (g) (1, 2), (3, 3). (H/S)
- (11) p. 43, Exercise 1.4.5(f): Answer should have sequence of elementary operations $E_{12}, E_{21}(-2), E_{31}(-1), E_{23}, E_2(-1), E_{32}(3), E_3(\frac{-1}{4}), E_{23}(1), E_{13}(-1), E_{12}(-2)$. (H/S)
- (12) p. 44, Exercise 1.4.9: Answer should be $0 \leq \text{rank}(A) < 3$. (H/S)
- (13) p. 44, Exercise 1.4.11(b): First equation should read $x_1 + 2x_2 - x_3 = c$. (H/S)

Chapter 2:

- (1) p. 68, line 10: Delete “ $A =$ ” from “ $A = I = \dots$ ”. (H/S)
- (2) p. 69, Exercise 2.2.7(c): Answer should be $\begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 3 \\ 0 & 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ -3x_2 \\ x_3 \end{bmatrix}$ or $\begin{bmatrix} 1 & 0 & 1 \\ 1 & -3 & 3 \\ 0 & -3 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$. (H/S)
- (3) p. 69, Exercise 2.2.11: Answers should be $A^2 = \begin{bmatrix} -1 & -8 \\ 4 & 7 \end{bmatrix}$, $BA = \begin{bmatrix} 6 & 8 \end{bmatrix}$, $AC = \begin{bmatrix} -9 \\ 16 \end{bmatrix}$, $AD = \begin{bmatrix} 3 & -1 & -2 \\ -2 & 9 & 3 \end{bmatrix}$. (H/S)
- (4) p. 70, Exercise 2.2.18: Replace $\mathbf{uv} + \mathbf{wu}$ by $\mathbf{uv} + \mathbf{wu}^T$. (H/S)
- (5) p. 71, Exercises: Missing Problem 28: “Determine the flop count for multiplication of $m \times p$ matrix A by $p \times n$ matrix B . (See page 48.)” (H)
- (6) p. 74, line 7: Replace “ $A = \begin{bmatrix} \frac{3}{2} & 0 \\ 0 & \text{frac}12 \end{bmatrix}$ ” by “ $A = \begin{bmatrix} \frac{3}{2} & 0 \\ 0 & \frac{1}{2} \end{bmatrix}$ ”. (H/S)
- (7) p. 112, Exercise 2.5.5(e): Answer should be $E_2(\frac{1}{3})E_1(-1)E_{21}$ (i). (H/S)
- (8) p. 113, Exercise 2.5.23: Replace “if A and B are invertible matrices” by “if A and B are matrices”. (H/S)
- (9) p. 114, Exercise 2.5.27: Replace “Exercise 26” by “Exercise 17”. (H/S)

- (10) p. 117, line 13: Replace " $A_{ij} = (-1)^{i+j} M(A)$ " by " $A_{ij} = (-1)^{i+j} M_{ij}(A)$ ". (H/S)
- (11) p. 125, line 9: Switch the variables x_1 and x_2 in the solution. (H/S)
- (12) p. 137, line 2: Replace second row $-8, -2$ of $B \otimes A$ by $8, 4$. (H/S)
- (13) p. 138, line 1: Replace " $IAX + (-I)XB$ " by " $AXI + (-I)XB$ ". (H/S)
- (14) p. 143, Exercise 2.7.6: Vectors should be listed as " $\mathbf{x}^{(0)}$ ", " $\mathbf{x}^{(1)}$ ", and " $\mathbf{x}^{(2)}$ ". (H/S)

Chapter 3:

- (1) p. 150, line 3: Change " $((1 - 2i))$ " to " $(1 - 2i)$ ". (H/S)
- (2) p. 158, line 20: Change " $T(f((x)))$ " to " $T(f(x))$ ". (H/S)
- (3) p. 180, Exercise 3.3.4: Change " \mathbb{R}^3 " to " \mathbb{R}^4 ". (H/S)
- (4) p. 182, Exercise 3.3.17: Answer should be $\begin{bmatrix} \frac{1}{2} & 0 \\ 0 & \frac{3}{2} \end{bmatrix}$. (H/S)
- (5) p. 182, Exercise 3.3.18: Replace $\pi/4$ by $\pi/6$. (H/S)
- (6) p. 198, Exercise 3.5.22: Statement should be "Show that a set of vectors $\mathbf{v}_1, \mathbf{v}_2, \dots, \mathbf{v}_n$ in the vector space V is a basis if and only if it has no redundant vectors and $\dim V \leq n$." (H/S)

Chapter 4:

- (1) p. 219, line 1: Change " $= -6 - 3 + 3 =$ " to " $= -6 - 3 + 9 =$ ". (H/S)
- (2) p. 219, line 11: Change " $(\mathbf{u} \cdot \mathbf{v}) \mathbf{w} - (\mathbf{u} \cdot \mathbf{v}) \mathbf{w}$ " to " $(\mathbf{u} \cdot \mathbf{w}) \mathbf{v} - (\mathbf{u} \cdot \mathbf{v}) \mathbf{w}$ ". (H/S)
- (3) p. 219, Exercise 4.1.3(a): Answer should be $-\frac{\sqrt{145}}{145}$. (H)
- (4) p. 221, lines 19 and 22: Change " $\|\mathbf{u}\|$ " and " $\|\mathbf{v}\|$ " to " $\|\mathbf{u}\|^2$ " and " $\|\mathbf{v}\|^2$ ". (H/S)
- (5) p. 226, line 8: Change " $\dim \mathbf{a}^\perp = n$ " to " $\dim \mathbf{a}^\perp = n - 1$ ". (H/S)
- (6) p. 227, line -9: Sentence should be "It can be shown that if A is known, the errors in b are normally distributed, and the least squares solution unique, then it is an unbiased estimator of the true solution in the statistical sense." (H)
- (7) p. 230, line -9: Change " $\dots \begin{bmatrix} 1 \\ -1 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 2 \end{bmatrix} \dots$ " to " $\dots \begin{bmatrix} 1 \\ -1 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 2 \end{bmatrix} \dots$ ". (H/S)
- (8) p. 231, Exercise 4.2.3(b): Vectors should be $(3, 0, 4), (2, 2, 1)$. (H)
- (9) p. 231, Exercise 4.2.5: Answers should be (a) $|\mathbf{u} \cdot \mathbf{v}| = 1 \leq \|\mathbf{u}\| \|\mathbf{v}\| = \sqrt{15}$
 (b) $|\mathbf{u} \cdot \mathbf{v}| = 19 \leq \|\mathbf{u}\| \|\mathbf{v}\| = 2\sqrt{165}$ (c) $|\mathbf{u} \cdot \mathbf{v}| = 26 \leq \|\mathbf{u}\| \|\mathbf{v}\| = 26$. (H/S)
- (10) p. 231, Exercise 4.2.7(b): Replace $(1, 1, 1)$ by $(0, 1, 1)$. (H/S)
- (11) p. 239, Figure 4.4: Vector marked " $H_{\mathbf{w}}$ " should be " $H_{\mathbf{v}\mathbf{w}}$ ". (H/S)
- (12) p. 241, Exercise 4.3.9(c): Answer should be $\begin{bmatrix} 1 & 0 \\ 0 & i \end{bmatrix}$ (H/S)
- (13) p. 244, Theorem 4.11: The correct statement should be "If $U_B \xrightarrow{S} V_C \xrightarrow{T} W_D$, then $[T \circ S]_{B,D} = [T]_{C,D}[S]_{B,C}$." Accordingly, the subscripts should be changed in the proof, i.e., second line of proof should have " $[T \circ S]_{B,D} [\mathbf{u}]_B = [(T \circ S)(\mathbf{u})]_D$ ", fourth line should have " $[T \circ S]_{B,D} [\mathbf{u}]_B = [(T \circ S)(\mathbf{u})]_D = [T(S(\mathbf{u}))]_D = [T(\mathbf{v})]_D$ ", sixth line should have " $[S(\mathbf{u})]_C = [S]_{B,C} [\mathbf{u}]_B$ ",

seventh line should have “ $[T \circ S]_{B,D} [\mathbf{u}]_B = [T]_{C,D} [\mathbf{v}]_C = [T]_{C,D} [S]_{B,C} [\mathbf{u}]_B$ ”, and eighth should have “ $\mathbf{e}_j = [\mathbf{u}]_B$ ”. (H/S)

Chapter 5:

- (1) p. 256, line 6: Replace “its” by “it’s”. (H/S)
- (2) p. 258, line 7: Replace $\mathcal{E}_{1+i}(A)$ by $\mathcal{E}_{1-i}(A)$. (H/S)
- (3) p. 262, Problem 5.1.15: Replace “ane” by “and”. (H/S)
- (4) p. 265, line -8: Delete $\mathbf{Ax} =$ at start of displayed equation. (H/S)
- (5) p. 267, line -5: “ $\sin(\pi A) =$ ” should be “ $\sin\left(\frac{\pi}{2}A\right) =$ ”. (H/S)
- (6) p. 270, Exercise 5.2.5: Replace “if $p(A) = 0$ ” by “if $q(A) = 0$ ”. (H/S)
- (7) p. 270, Exercise 5.2.5: Answer should be “True in every case. (a) and (c) satisfy $q(A) = 0$ and are diagonalizable, (b) and (d) are not diagonalizable and $q(A) \neq 0$.” (H/S)
- (8) p. 275, line 12: Replace “ $10A$ ” by “ A ”. (H/S)
- (9) p. 280, Exercise 5.3.1(d): Answer should be “no dominant eigenvalue”. (H/S)
- (10) p. 280, Exercise 5.3.5(d): Answer should be that ergodic theorem does not apply to it. (H)
- (11) p. 280, Exercise 5.3.7: Answer should be “diag $\{A, B\}$, where possibilities for A are diag $\{J_1(2), J_1(1)\}$, $J_2(2)$ and possibilities for B are diag $\{J_1(3), J_1(3), J_1(3)\}$, diag $\{J_1(3), J_2(3)\}$, diag $\{J_3(3)\}$ ”. (H/S)
- (12) p. 281, Exercise 5.3.11: “three state” should be “three stage”. (H)
- (13) p. 281, Exercise 5.3.12: The last sentence should read: “Compare the growth rate to a constant interest rate that closely matches the model.” (H)
- (14) p. 282, Problem 5.3.16: “choice of $a, b \in \mathbb{R}$.” should be “choice of $a, b \in \mathbb{R}$ with $b \neq 0$.” (H/S)
- (15) p. 282, Problem 5.3.17: Promote Problem 17 and following up one number. Problem 17 is “Show that 1 is an eigenvalue for all stochastic matrices.” (H)
- (16) p. 284, line -9,-10: Replace “ \mathbf{v}_2^* ” by “ $\tilde{\mathbf{v}}_2$ ”. (H/S)
- (17) p. 286, Exercise 5.4.2(c): Blank (3, 3)th entry of matrix should be 0. (H/S)
- (18) p. 287, Exercise 5.4.9: Replace “ $B = P \text{diag}\{1, \sqrt{2}, 4\} P^T$ ” by “ $B = P \text{diag}\{1, \sqrt{2}, 2\} P^T$ ”. (H/S)
- (19) p. 288, line 14: Replace “it follows from Exercise 5 that $H_{\mathbf{v}}\mathbf{w} = \mathbf{e}_1$ ” by “one checks that $H_{\mathbf{v}}\mathbf{w} = \mathbf{e}_1$ (see the proof of Theorem ??)”. (H/S)
- (20) p. 292, line 9: replace “right singular values” by “right singular vectors”. (H/S)
- (21) p. 293, Exercise 5.6.1(c): Answer should be $U = E_{12}E_{13}$, $V = \begin{bmatrix} 0 & 1 & 0 \\ -\frac{\sqrt{5}}{5} & 0 & \frac{2\sqrt{5}}{5} \\ \frac{2\sqrt{5}}{5} & 0 & \frac{\sqrt{5}}{5} \end{bmatrix}$. (H/S)

Chapter 6:

- (1) p. 311, Exercise 6.1.3(a): Answer for infinity norm should be $\frac{1}{3}(1, -3, -1)$. (H/S)
- (2) p. 320, line 3: Replace “Another useful corollary” by “Another useful corollary to Theorem 6.3”. (H/S)

- (3) p. 320, Exercise 6.2.1: Answer for (a) should have $|\langle \mathbf{u}, \mathbf{v} \rangle| = 46$, $\|\mathbf{u}\| = \sqrt{97}$, $\|\mathbf{v}\| = \sqrt{40}$ and $46 \leq \sqrt{97}\sqrt{40} \approx 62.29$ and (b) should have $\|\mathbf{v}\| = \frac{1}{\sqrt{7}}$ and $\frac{1}{5} = 0.2 \leq \frac{1}{\sqrt{3}} \frac{1}{\sqrt{7}} \approx 0.2182$. (H/S)
- (4) p. 320, Exercise 6.2.3(b): Answers should be $\frac{7}{5}x^3$, $\frac{\sqrt{7}}{5}$, $x - \frac{7}{5}x^3$. (H/S)
- (5) p. 331, Exercise 6.3.5(a): Answer for $\text{proj}_V \mathbf{w}$ should be $\frac{1}{6}(23, -5, 14)$. (H)
- (6) p. 331, Exercise 6.3.9: Replace “ $\mathbf{w}_1 = (-1, -1, 1, 1)$ ” by “ $\mathbf{w}_1 = (-1, 1, 1, -1)$ ” . (H)
- (7) p. 341, Exercise 6.4.8: Change “page 335” to “page 336”. (H/S)
- (8) p. 343, Theorem 6.15: Swap “ $\|A\|_1$ ” of (1) with “ $\|A\|_\infty$ ” of (2). (H/S)
- (9) p. 345, line -10: Replace “ $A^{-1}(I + A^{-1}\delta A)\delta \mathbf{x}$ ” by “ $A^{-1}(I + A\delta A)\delta \mathbf{x}$ ”.
- (10) p. 347, Exercise 6.5.1(c): Answer should be $2\sqrt{17}$, 10, 10. (H/S)
- (11) p. 347, Exercise 3: Change “ $\delta \mathbf{b} = 0.05\mathbf{b}$ ” to “ $\delta \mathbf{b} = 0.5\mathbf{b}$ ” (H/S)
- (12) p. 347, Exercise 6.5.3: Answer should be “Calculate $c = \|A^{-1}\delta A\| = 0.05\|I_3\| = 0.05 < 1$, $\frac{\|\delta A\|}{\|A\|} = 0.05$, $\frac{\|\delta \mathbf{b}\|}{\|\mathbf{b}\|} = 0.5$, $\text{cond}(A) \approx 6.7807$. Hence, $\frac{\|\delta \mathbf{x}\|}{\|\mathbf{x}\|} \approx 0.42857 < \frac{\text{cond}(A)}{1-c} \left[\frac{\|\delta A\|}{\|A\|} + \frac{\|\delta \mathbf{b}\|}{\|\mathbf{b}\|} \right] \approx 1.7844$. ” (H/S)
- (13) p. 347, Problem 6.5.7: Statement should be “ $\|A\|_1 = \max_{1 \leq j \leq m} \{ \sum_{i=1}^n |a_{ij}| \}$.” (H/S)
- (14) p. 354, Exercise 6.6.1: Answer for $\text{cond}(A) \|\delta \mathbf{b}\|_\infty / \|\mathbf{b}\|_\infty$ should be 2.5873. (H/S)