Linear Algebra for the Young Mathematician–Errata

Most of these errata were found by Bruce Gould, Joel Brewster Lewis and his students, and Patrice Goyer, whom the author sincerely thanks.

Page xi: Add the following before paragraph -4

As is customary in linear algebra, in this book we use the word "set" as shorthand for ordered multiset, so that the "sets" $\{v\}$ and $\{v, v\}$ are distinct and also the "sets" $\{v_1, v_2\}$ and $\{v_2, v_1\}$ are distinct if $v_2 \neq v_1$. (Actually, this works fine in the finite-dimensional case but in the infinite-dimensional case we need the more general notion of an indexed multiset, but we will not pursue this here.)

Also, for us the "number of elements in a set" is $0, 1, 2, \ldots$ or ∞ (infinity). That is, in this book we do not distinguish between the cardinalities of infinite sets.

Page 15, line 10: $\mathcal{T}_A = Av$ should be $\mathcal{T}_A(v) = Av$

Page 15, lines 14 and 17: the function should be a function

Page 15, line 16: 22 should be 52

Page 19, line 12: Delete the word homogeneous

Page 20, line 3: $2a'_{22}x_2$ should be $a'_{22}x_2$

Page 20, line -10: $\{u_1, u_2, \ldots, u_m\}$ should be $\{u_1, u_2, \ldots, u_n\}$

Page 21, line 21: $\mathcal{T}(v_2)$ should be $\mathcal{T}_A(v_2)$

Page 21, line 23: $+$ should be $=$

Page 22, line -9: Definition 1.2.10 should be Definition 1.2.9

Page 26, problem 6: The bottom entry of v_2 should be 9

Pages 26 and 27, problems 8, 9, and 10: all occurrences of $\mathbb{F}$ should be $\mathbb{R}$

Page 39, line 9: $\tilde{A} = \tilde{b}$ should be $\tilde{A}x = \tilde{b}$

Page 42, line 5: $\tilde{A}x = b$ should be $\tilde{A}x = \tilde{b}$

Page 46, line 6: steps (0)-(2') should be steps (0')-(2')

Page 50, fourth sentence: (-3) row 3 to row 2 should be (-2) row 3 to row 2

Page 50, line -3: *row-reduced echelon form* should be *reduced row-echelon form*

Page 50, line -2: *some zero* should be *some zero row*

Page 52, second displayed formula: x_{1j_1} should be x_{j_1} and similarly for x_{2j_2} and x_{kj_k}

Page 53, line 2: $k = n$ should be $k = m$

Page 53, line -11: row-reduced echelon form should be reduced row-echelon form

Page 55, Problem 6(b): $ab - bc$ should be $ad - bc$

Page 68, line -3: $\mathbb{F}^3$ should be $\mathbb{F}^4$

Page 69, line 6: which reduces to $\begin{bmatrix} 1 & 1 & 2 & | & 3 \\ 0 & 1 & 3 & | & 4 \\ 0 & 0 & 1 & | & 2 \\ 0 & 0 & 0 & | & 0 \end{bmatrix}$ should be

which reduces to $\begin{bmatrix} 1 & 1 & 2 & | & 3 \\ 0 & 1 & 3 & | & 5 \\ 0 & 0 & 1 & | & 2 \\ 0 & 0 & 0 & | & 0 \end{bmatrix}$

Page 70, line 11: (d) should be (b)

Page 71, statement of Lemma 3.3.4: *with* $n > m$ should be *with* $n > m$ *(possibly* $n = \infty$ *)*

Page 71, proof of Lemma 3.3.4: Insert as first line of proof: Since $\mathcal{D}$ is linearly dependent if any subset of it is, it suffices to consider the case $\mathcal{D}$ finite.

Page 73, line -12: set of n vectors should be set of m vectors

Page 73, line -11: which has $m < n$ vectors should be which has $n < m$ vectors

Page 75, line 1: This should read We prove the contrapositive of (1) and the only if part of (2), and we prove the if part of (2) directly.

Page 75, lines -13 and -11: in V should be in $\mathcal{B}$

Page 75, line -12: in v should be in $\mathcal{B}$

Page 79, line -1: subset should be subspace

Page 81, lines 10, 11: All four occurrences of S should be Span(S)

Page 81, line -11: Span(W) should be W

Page 84, line -15: Add at the end of Remark 3.4.17 (See Chapter 5 Exercise 20 (c).)

Page 87, line -5: see every should be see that every

Page 93, line -8: $v = t_1 + w$ should be $v = t_1 + w_1$

Page 94: Add after Definition 3.5.11: Note that this is well-defined, as W is unique by Lemma 3.5.13 below.

Page 97, Problem 6(f): $2 + 3 + 7x^2 + 9x^3$ should be $2 + 3x + 7x^2 + 9x^3$

Page 101, Exercise 18: function should be continuous function

Pages 106 and 107: Exchange $\mathcal{S}$ and $\mathcal{T}$ in the statement of Corollary 4.1.12

Page 109, line -3: $A = (c_{ij})$ should be $A = (a_{ij})$

Page 110, line -5: vA should be vB

Page 110, line -3: This line should read

$$vB = \big[d_1b_{11} + d_2b_{21} + \cdots + d_mb_{m1} \quad d_1b_{12} + d_2b_{22} + \cdots + d_mb_{m2} \quad \ldots \quad d_1b_{1n} + d_2b_{2n} + \cdots + d_mb_{mn}\big].$$

Page 110, line -7: Corollary 3.5.7 should be Corollary 4.2.7

Page 112, lines -13, -7: B should be $\mathcal{B}$

Page 112, line -6: $\mathcal{T}(v) = \sum c_iv_i$ should be $\mathcal{T}(v) = \sum c_i\mathcal{T}(v_i) = \sum c_iw_i$

Page 113, line -16: w should be w_0

Page 114, line -11: C should be $\mathcal{C}$

Page 115, lines 19 and 21: Lemma 4.3.7(1) should be Lemma 4.3.7(2) and Lemma 4.3.7(2) should be Lemma 4.3.7(1)

Page 115, line -1: Definition 3.3.1 should be Definition 4.1.1

Page 119, line 7: for some element u of U should be for some element u of U and some element w of W

Page 120, line 9: U should be $\mathcal{U}$

Page 120, proof of Lemma 4.3.21 (2): This proof can be simplified by replacing Let $\mathcal{B} = \{v_1, v_2, \dots\}$ be a basis of V. Then by Lemma 4.3.7, $\mathcal{C} = \mathcal{T}(\mathcal{B}) = \{w_1, w_2, \dots\}$ spans W, so by Corollary 3.3.17 $\mathcal{C}$ has a subset $\mathcal{C}_0$ that is a basis of W. by Let $\mathcal{C}_0 = \{w_1, w_2, \dots\}$ be a basis of W.

Page 120, line -8: Let is should be Let us

Page 121, line 18: The third term in the displayed equation should be $(\mathcal{T}^{-1}\mathcal{T})\mathcal{U}$

Page 121, line -16: $\mathcal{S}$ should be $\mathcal{S}\mathcal{T}$

Page 122, line -3: *invertible* should be *invertible*, or *nonsingular*,

Page 131, line -13: $\mathrm{Int}_a(\mathrm{Der}(f(x)))$ should be $\mathrm{Int}_a(\mathrm{Der}(F(x)))$

Page 139, line -5 and Page 140 line 2: Lemma 3.2.3 should be Lemma 3.4.3

Page 139, line -4 and Page 140 line 3: Lemma 3.3.3 should be Lemma 4.1.3

Page 144, line -4: $(e_1 + 1)$ should be $(e_i + 1)$

Page 145, line 9: $j = 0, \dots, e_n$ should xpeb $j = 0, \dots, e_i$

Page 145, line 10: $(x - a_i)^{e_n+1}$ should be $(x - a_i)^{e_i+1}$

Page 147, line 1: $e_1 = e_2 = 2$ should be $e_1 = e_2 = 1$

Page 158, line -5: Add to the end of Example 5.3.7 Note that the case $i = 0$ of these two identities yield very classical formulas for the (signed) sums of binomial coefficients.

Page 165, line 6: $\mathcal{T}_1 = \mathcal{S}^{-1}\mathcal{T}_2\mathcal{S}$ should be $\mathcal{T}_1 = \mathcal{S}\mathcal{T}_2\mathcal{S}^{-1}$

Page 169, line 10: $u \in V^*$ should be $u^* \in V^*$

Page 170, line 14: (a_0) should be $p(a_0)$ and (a_1) should be $p(a_1)$

Page 172, line -19: Replace But, as we have already seen by But, as we see from the first paragraph of this proof (extending v_0 to a basis $\mathcal{B}$ of V)

Page 173, line -7: $u^*(\tilde{v}_j)$ should be $u_i^*(\tilde{v}_j)$

Page 174, line 18: $\mathcal{C}_2$ spans should be $\mathcal{C}_2^*$ spans

Page 175, lines 1-2: Replace Suppose that $\mathcal{T}$ and $\mathcal{T}^*$ are invertible by Suppose that at least one of $\mathcal{T}$ and $\mathcal{T}^*$ is invertible, and hence that both are, by Theorem 5.6.2

Page 175, line -7: $[\mathcal{T}^*]_{\mathcal{B}^* \leftarrow \mathcal{C}}$ should be $[\mathcal{T}^*]_{\mathcal{B}^* \leftarrow \mathcal{C}^*}$

Page 175, line -3: $\mathcal{T}^*(x_i)^*(v_j)$ should be $\mathcal{T}^*(x_i^*)(v_j)$

Page 176, lines 9 through 15: $\mathcal{T}$ should be $\mathcal{T}^*$ throughout

Page 180, lines -14 and -13: Let B be a fixed n-by-n matrix should be Let B be a fixed invertible n-by-n matrix

Page 186, line 19: $[T]_{\mathcal{B}}$ should be $[\mathcal{T}]_{\mathcal{B}}$

Page 187, line 16: $\mathcal{T}$-Span$(\mathcal{S})$ should be $\mathcal{T}$-Span$(\mathcal{C})$

Page 196, lines 1-2: v_1 has length 1 should be v_1 has length 5

Page 201, line 6: between i and $n-1$ should be between 1 and $n-1$

Page 202, line 12: u_1 should be w_1 and u_2 should be w_2

Page 202, line -9: $(-1)^{p+q}\det(N_{pq}^1)$ should be $(-1)^{p+q}c_1\det(N_{pq}^1)$

Page 202, line -8: $(-1)^{p+q}\det(N_{pq}^2)$ should be $(-1)^{p+q}c_2\det(N_{pq}^2)$

Page 203, lines 12 and 13: Each v should be u (with the same subscript) and each w should be x

Page 203, lines -19 through -16: w should be x, v_{i+1} should be u_{i+1}, and v_{i+2} should be u_{i+2}

Page 207, line -3: e_ρ should be ε_ρ

Page 210, line 23: Suppose that $\sigma(i) = p$ and $\sigma(k) = r$. should be Suppose that $\sigma(p) = i$ and $\sigma(r) = k$.

Page 212, line -5: In both 2-by-2 determinants, the entry in the upper right-hand corner should be -5

Page 212, line -3: This line should read $= 2(-5)(-1)(5)|13| = 2(-5)(-1)(5)(13) = 650$.

Page 224, line -1: $\begin{bmatrix} -30 & 36 \\ -25 & 30 \end{bmatrix}$ should be $\begin{bmatrix} -30 & 36 \\ -25 & 30 \end{bmatrix} \begin{bmatrix} 6 \\ 5 \end{bmatrix}$

Page 225, line -8: eigenvector 0 should be eigenvalue 0

Page 299, line -2: *in V* should be *on V*

Page 312, line 2: $[\varphi]$ should be $[\overline{\varphi}]$

Page 312, line 16: $\psi(x, \mathcal{T}^*(y))$ should be $\varphi(x, \mathcal{T}^*(y))$

Page 332, line -1: $(\langle z, x_i\rangle / \|x_i\|)^2$ should be $(\langle z, x_i\rangle / \|x_i\|^2)$

Page 333, line 5: $(\langle w_0, x_i\rangle / \|x_i\|)^2$ should be $(\langle w_0, x_i\rangle / \|x_i\|^2)$