Errata

Chapter 1

Matrices

1.1 The basic operations

October 7, 2021

Math 1.1.1. Page 7: Denoting inverse of A by A^{-1} should be deferred until proving its uniqueness.

1.4 Determinants

Math 1.4.1. Page 20: In the last paragraph, in "...except for those in the rows indexed by k.", "rows" must be replaced by the singular "row". Also mention that the other rows of D (that is, those not indexed by k) are equal to the corresponding rows of A (and hence B).

Also, in (1.4.8), replace the index i with k to maintain consistency.

Math 1.4.2. Page 23: The submatrices are wrongly referred to as minors at various places.

Exercises

October 27, 2021

Math 1.1. Page 32: In Exercise 1.13, it'll be cleaner (and still equivalent) to replace $I + A$ with $I - A$.

Math 1.2. Page 32: In Exercise 1.15, e_j in $e_j A e_k$ should be replaced by e_j^T.

Math 1.3. Page 34: In Exercise 5.4, the boldface is confusing. Omit it.

Math 1.4. Page 35: In Exercise M.7 (c), $p(t)$ is of degree *at most* n and not necessarily n.

Chapter 2

Groups

2.1 Laws of composition

October 28, 2021

Math 2.1.1. Page 39: In Proposition 2.1.4, condition (ii) is implied by (iii) and can (so, must) be dropped.

2.4 Cyclic groups

October 29, 2021

Math 2.4.1. Page 46: In Proposition 2.4.2 (b) $r \geq s$ is redundant.

2.8 Cosets

November 4, 2021

Math 2.8.1. Page 58: In the paragraph after Corollary 2.8.13, mention that $n \geq 2$.

Math 2.8.2. Page 58: The proof of Proposition 2.8.14 is wrong/incomplete: That $g_i h_1 K, \ldots, g_i h_n K$ will be a partition of K follows not due to the fact that "multiplication by g_i is an invertible operation". instead, it follows since $K \subseteq H$ and that group multiplication is associative.

Also, it should be noted that $g_i h_j K$ actually stands for $(g_i h_j)K$.

Math 2.8.3. Page 59: The notation gHg^{-1} should be explained (or refer to Exercise 6.7, where it is explained): It is *not* a coset (since gH or Hg^{-1} may fail to form subgroups). Instead, it is the set $\{ghg^{-1} : h \in H\}$.

Math 2.8.4. Page 59: In Proposition 2.8.18 (a), it is used that the image of a subgroup under a homomorphism is a homomorphism, but never proved before.

2.10 The correspondence theorem

November 9, 2021

Math 2.10.1. Page 62: In Example 2.10.3, n's in "...such as an n-cycle with n odd. ..." must be replaced by k (or some other symbol which should not be n).

2.11 Product groups

November 11, 2021

Non-math 2.11.1. Page 64: The second paragraph has a missing period in the sentence before Figure (2.11.2).

Math 2.11.2. Page 64: In second paragraph, the 1's in $G \times 1$ and $1 \times G'$ should be replaced with $\{1\}$.

2.12 Quotient groups

November 11, 2021

Math 2.12.1. Page 66: The consistency of notation $\mathbb{Z}/\mathbb{Z}n$ with that introduced for Quotient groups should be checked. (Similarly, the consistency of $a + \mathbb{Z}n$ with the definition of cosets given later should be checked.)

Exercises

November 13, 2021

Math 2.1. Page 70: In Exercise 4.2, mention to use that the n-th roots of unity are $\{e^{i2\pi\theta/n}\}_{\theta=0}^{n-1}$.

Math 2.2. Page 70: In Exercise 4.7, mention x, y and 1 to be all distinct.

November 19, 2021

Math 2.3. Page 73: In Exercise 8.10, mention that cosets of H are to be found in G, and *not* in $GL_2(\mathbb{R})$.

Math 2.4. Page 73: In Exercise 8.12, aS is called a coset even though S is *not* a subgroup. The text defined cosets only fr subgroups.

Math 2.5. Page 73: In Exercise 9.3, mention a to be a *positive* integer.

Math 2.6. Page 74: In Exercise 10.3, mention that the existence of such a ϕ is possible since 6 divides 12.

Math 2.7. Page 77: In Exercise M.11, (b), mention explicitly that we are talking od only invertible matrices. The decomposition is not unique for non-invertible matrices. (See this.)

Chapter 3

Vector spaces

November 20, 2021

3.1 Subspaces of $\mathbb{R}^n$

Math 3.1.1. Page 79: In (3.1.3), use k instead of n since n is already used in stating that W is a subspace of $\mathbb{R}^n$.

Non-math 3.1.2. Page 79: In checking that the nullspace is a subspace, in the second bullet point, cX in "AcX" should be enclosed in parentheses.

Math 3.1.3. Page 79: In the proof of Proposition 3.1.4, the proof of the second part is presented before the first, which it implicitly uses.

Math 3.1.4. Page 81: In Definition 3.2.2 (iii) third bullet point, remark the precedence convention for multiplication and addition so that $ab + ac$ means $(ab) + (ac)$.

3.2 Fields

November 22, 2021

Math 3.2.1. Page 84: In the proof of Lemma 3.2.10, it is implicitly assumed that $\underbrace{1 + \cdots + 1}_{rs \text{ times}} = (\underbrace{1 + \cdots + 1}_{r \text{ times}}) \times (\underbrace{1 + \cdots + 1}_{s \text{ times}})$. It is unnoticed because of

the usage of the familiar bar notation for equivalence classes, in which it is true that $\bar{r}\bar{s} = \overline{rs}$. But it is not *a priori* true here. It must be stated as an exercise or a separate lemma.

Non-math 3.2.2. Page 85: In the paragraph after Example 3.3.4, the "bijective map" in "... bijective map such that..." should be omitted.

3.5 Computing with bases

December 6, 2021

Math 3.5.1. Page 94: In the $(\cos t, \sin t)$ example of basechange computaion, remark that the basechange matrix has to be a matrix of complex numbers and not functions (in which case, a general matrix $\begin{bmatrix} 1+(i-x)\tan t & 1-(i+y)\tan t \\ x & y \end{bmatrix}$ with $x, y \in \mathbb{C}$ would suffice).

Exercises

December 11, 2021

Non-math 3.1. The first section in the text is *Subspaces of* $\mathbb{R}^n$. But the *Exercises* enlist the *Fields* to be the first section. Fix this.

December 24, 2021

Math 3.2. Page 100: Exercise 5.1 can be generalized for any field (and not just $\mathbb{R}$) with characteristic not equal to 2.

Math 3.3. Page 100: In Exercise 5.3, 0's should be replaced with $\{0\}$'s.

Math 3.4. Page 101: In Exercise 6.3, replace "For every positive integer, we..." with "For every positive integer p, we...".

December 29, 2021

Math 3.5. Page 101: In Exercise M.2, the coefficient c_0 in the polynomial equation should be accompanied by the indentity matrix I.

Chapter 4

Linear Operators

4.1 The matrix of a linear transformation

January 3, 2022

Math 4.1.1. Page 105: In Proposition 4.2.5, the order of quantifier should be revised. It states that for any $X_{n\times 1}$ and any $Y_{n\times 1}$, there exists a matrix A. Rather, existence should be outside with the double universal quantification nested inside it.

4.3 Linear operators

January 6, 2022

Math 4.3.1. After the proof for Proposition 4.3.1, also remark that (b) is not necessarily true for infinite-dimensional spaces. (The same examples as given for the similar comment afout (a) will suffice.)

Appendix

December 29, 2021

Math 4.1. Page 514: In A.1.2 (ii), "$k > 1$" should be "$k \geq 1$". Also, in the following line, "$k \geq 0$" should be replaced by "$k \geq 1$" (since the sentences P_k are indexed by $n \in \mathbb{N} = \{1, 2, 3, \ldots\}$).

Math 4.2. Page 515: The line "So a proof using complete induction must include a proof of P_1." must be omitted—if the statement that "If n is a positive integer and P_k is true for every positive integer $k < n$, then P_n is true." is already proven, then no need to explicitly show P_1's proof.