ERRATA

Abstract Algebra, Second Edition

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The following are errata for the Prentice–Hall printing of the book only; these changes have all been incorporated in all Wiley printings. Additional errata for the Wiley printings (separate file) must also be incorporated in the Prentice-Hall printing.

page 133, line 4 in Exercise 14
from: Let $\tau = (2\ 4\ 3)$
to: Let $\tau = (2\ 4)$

page 139, line 4 in the Example
from: and $\mathrm{Aut}(P)$ has order 6 or 24
to: and $\mathrm{Aut}(P)$ has order 6 or 48

page 186, between lines 2 and 3 of Exercise 6
add: If K is infinite assume φ_1 and φ_2 are injective.

page 193, line 3 in the Proof of Proposition 2
from: by Theorem 1(1). Thus if $Z_i(P) \neq 1$ then ...
to: by Theorem 1(1). Thus if $Z_i(P) \neq G$ then ...

page 200, line –1
from: (if G has no maximal subgroups, set $\Phi(G) = 1$).
to: (if G has no maximal subgroups, set $\Phi(G) = G$).

page 209, under subheading Simple Groups of Order 168, line 6
from: there is a simple group of order 168: $GL_2(\mathbb{F}_3)$
to: there is a simple group of order 168: $GL_3(\mathbb{F}_2)$

page 212, Proposition 14(1)
from: $n_3 = 7$
to: $n_3 = 28$

page 239, last line in Exercise 2
from: implies $b_0 p(x) = 0$
to: implies $b_m p(x) = 0$

page 258, line 1 in Exercise 12
from: Suppose $I =$
to: Assume R is commutative and suppose $I =$

page 270, line 1 in Exercise 10(b)
from: Under the hypotheses in (a), for each $i \in I$
to: Assume the hypotheses in (a), and let $I = \mathbb{Z}^+$ (usual ordering). For each $i \in I$

page 278, line 2 in the Proof of Proposition 5
from: For any $x \in D$
to: For any $x \in R$

page 281, lines 5 and 6
from: (cf. Exercise 4 and the example following Proposition 12 below).
to: (cf. Exercise 5 and the example preceding Proposition 12 below).

page 282, line 4 in the Proof of Corollary 8
from: By Proposition 6,
to: By Proposition 7,

page 283, Exercise 2
from: (cf. Exercise 10
to: (cf. Exercise 11

page 284, Exercise 5(c)
from: $I_2I_3 = (1+\sqrt{-5})$ and $I_2I_3' = (1-\sqrt{-5})$
to: $I_2I_3 = (1-\sqrt{-5})$ and $I_2I_3' = (1+\sqrt{-5})$

page 287, lines 2 and 5 in the paragraph before Proposition 12
from: Proposition 9 [referenced twice]
to: Proposition 11

page 287, line 1 in the Proof of Proposition 12
from: Since by Proposition 8,
to: Since by Proposition 10,

page 293, line 2 in Exercise 2
from: (cf. Exercise 10
to: (cf. Exercise 11

page 294, line 3 in Exercise 8(c)
from: (cf. Exercise 4
to: (cf. Exercise 5

page 294, line 3 of the Remark:
from: cf. Exercise 8 in Section 2
to: cf. Exercise 8 in Section 1

page 295, last line in Exercise 10(b)
from: Theorem 12.]
to: Theorem 14.]

page 341, fourth set of displayed expressions

from (middle line):

$$(s's, n_1+n_2) = (s's, n_1) - (s's, n_2), \text{ and}$$

change entire display and following sentence to:

$$\begin{gathered}(s'(s_1+s_2), n) - (s's_1, n) - (s's_2, n) \ \big(= (s's_1 + s's_2, n) - (s's_1, n) - (s's_2, n)\big),\\ (s's, n_1+n_2) - (s's, n_1) - (s's, n_2), \text{ and}\\ (s'(sr), n) - (s's, rn) \ \big(= ((s's)r, n) - (s's, rn)\big)\end{gathered}$$

each belongs to the set of generators in (3), so in particular each lies in the subgroup H.

page 343, last 2 lines
from: (Corollary 15
to: (Corollary 18

page 444, line prior to second display

from: Remainder Theorem (Theorem 7.15)

to: Remainder Theorem (Theorem 7.17)

page 449, Exercise 12(b)

from: Suppose M_1 and M_2 are two finitely generated R-modules.

to: Suppose M_1 and M_2 are isomorphic finitely generated R-modules.

page 481, replace Exercise 29 with

29. Suppose V_i is the generalized eigenspace of T corresponding to eigenvalue λ_i. For any $k \geq 0$, prove that the nullity of $T - \lambda_i$ on the subspace $(T - \lambda_i)^k V_i$ is the same as the nullity of $T - \lambda_i$ on $(T - \lambda_i)^k V$ and equals the number of Jordan blocks of T having eigenvalue λ_i and size greater than k (so for $k = 0$ this gives the number of Jordan blocks).

page 482, replace Exercise 30 with

30. Let λ be an eigenvalue of the linear transformation T on the finite dimensional vector space V over the field F. Let $r_k = \dim_F (T - \lambda)^k V$ be the rank of the linear transformation $(T - \lambda)^k$ on V. For any $k \geq 1$, prove that $r_{k-1} - 2r_k + r_{k+1}$ is the number of Jordan blocks of T corresponding to λ of size k [use Exercise 12 in Section 1]. (This gives an efficient method for determining the Jordan canonical form for T by computing the ranks of the matrices $(A - \lambda I)^k$ for a matrix A representing T, cf. Exercise 31(a) in Section 11.2.)

page 584, third sentence in Exercise 12

from: Determine the characteristic polynomial

to: Determine the characteristic polynomial of σ_p and prove that the linear transformation σ_p is diagonalizable over $\mathbb{F}_p$ if and only if n divides $p - 1$, and is diagonalizable over the algebraic closure of $\mathbb{F}_p$ if and only if $(n, p) = 1$.

page 591, paragraph preceding and Proposition 33

from: When we first defined the alternating group A_n we saw that a permutation $\sigma \in S_n$ is an element of the subgroup A_n if and only if σ fixes the product

$$\sqrt{D} = \prod_{i<j} (x_i - x_j).$$

It follows (by the Fundamental Theorem) that $\sqrt{D}$ generates the fixed field of A_n and generates a quadratic extension of K. This proves the following proposition.

Proposition 33. The permutation $\sigma \in S_n$ is an element of A_n if and only if it fixes the square root of the discriminant D.

to: When we first defined the alternating group A_n we saw that a permutation $\sigma \in S_n$ is an element of the subgroup A_n if and only if σ fixes the product

$$\sqrt{D} = \prod_{i<j} (x_i - x_j) \in \mathbb{Z}[x_1, x_2, \dots, x_n].$$

It follows (by the Fundamental Theorem) that if F has characteristic different from 2 then $\sqrt{D}$ generates the fixed field of A_n and generates a quadratic extension of K. This proves the following proposition.

Proposition 33. If $\mathrm{ch}(F) \neq 2$ then the permutation $\sigma \in S_n$ is an element of A_n if and only if it fixes the square root of the discriminant D.

page 641, line –13
from: in affine 2-space over $\mathbb{R}$ the x-axis is
to: in affine 2-space over $\mathbb{R}$ the y-axis is

page 643, last line of Example
from: for any polynomial $f \in k[\mathbb{A}^n]$
to: for any polynomial $f \in k[x, y]$

page 643, last line of Definition
from: $\varphi \circ \psi = \psi \circ \varphi = 1$
to: $\varphi \circ \psi = 1_W$ and $\psi \circ \varphi = 1_V$

page 644, line 6
from: image under $\widetilde{\varphi}$
to: image under Φ

page 646, second line of Exercise 8
from: finitely generated module of a
to: finitely generated module over a

page 647, line 1 of Exercise 19
from: For each $f \in k[x]$
to: For each nonconstant $f \in k[x]$

page 647, line 2 of Exercise 20
from: is either $\mathbb{A}^2$ or
to: is either $\emptyset$ or

page 654, line 30
from: is the coarsest topology for which
to: is the coarsest topology in which points are closed and for which

page 661, line 2 of Exercise 7
from: If in addition I contains
to: If in addition φ is surjective and I contains

page 662, part (b) of Exercise 21
reword as:

(b) Let J be the ideal in $k[x_1, \dots, x_n, x_{n+1}]$ generated by $\mathcal{I}(V)$ and $x_{n+1}f - 1$, and let $W = \mathcal{Z}(J) \subseteq \mathbb{A}^{n+1}$. Show that $J = \mathcal{I}(W)$ and that the map $\pi : \mathbb{A}^{n+1} \to \mathbb{A}^n$ by projection onto the first n coordinates is a Zariski continuous bijection from W onto V_f (so the principal *open* set V_f in V may be embedded as a *closed* set in some (larger) affine space).

page 664, line 1
from: is a minimal primary decomposition of $\varphi^{-1}(I)$.
to: is a primary decomposition of $\varphi^{-1}(I)$, and is minimal if φ is surjective.

page 665, line 3 of Exercise 45(b)

from: vanishing for all $x < n$

to: vanishing for all $x < 1/n$

page 667, lines 7 and 9

from: $a_1, a_2, \dots, a_n$

to: $a_0, a_1, \dots, a_{n-1}$

page 669, Revise Statement of Corollary 22

to: Suppose R is a subring of the ring S with $1 \in R$ and assume S is integral and finitely generated (as a ring) over R. If P is a maximal ideal in R then there are only a finite (nonzero) number of maximal ideals Q of S with $Q \cap R = P$.

page 674, lines 5 and 6

from: We shall give a more . . . Lemma shortly, but first we use it to prove

to: A more "geometric" interpretation of Noether's Normalization Lemma is indicated in Exercise 15. We next use the Normalization Lemma to prove

page 686, Proof of Proposition 37, line 4

from: a maximal ideal of R containing M

to: a maximal ideal of R containing I

page 718, last 2 lines

from: (3). Then

$$\bigcap_{i=1}^{n} M_i^m \subseteq \left(\bigcap_{i=1}^{n} M_i\right)^m \subseteq (\mathrm{Jac}\, R)^m = 0.$$

to: (3). Then

$$\prod_{i=1}^{n} M_i^m \subseteq \left(\prod_{i=1}^{n} M_i\right)^m \subseteq (\mathrm{Jac}\, R)^m = 0.$$

page 719, Example (1), line 3 (displayed)

from: $\mathbb{Z}/n \cong$

to: $\mathbb{Z}/n\mathbb{Z} \cong$

page 723, Proof of Theorem 7, lines 9 to 11

from: Suppose (4) holds, . . . (Proposition 11, Section 15.2). Thus there is some $n \geq 0$ such that . . .

to: Suppose (4) holds, let $M = (t)$ be the unique maximal ideal of R, and let $M_0 = \cap_{i=1}^{\infty} M^i$. Then $M_0 = MM_0$, and since R is Noetherian M_0 is finitely generated. By hypothesis $M = \mathrm{Jac}\, R$, so by Nakayama's Lemma $M_0 = 0$. If I is any proper, nonzero ideal of R then there is some $n \geq 0$ such that . . .

page 724, line –2

from: Exercise 11(d), Section 7.6).

to: Exercise 11(c), Section 7.6).

page 878, line 5 above the Examples

from: if there is a morphism $g : B \to B$

to: if there is a morphism $g : B \to A$