Correction to: Ideals, Varieties, and Algorithms

Correction to:
D.A. Cox et al., *Ideals, Varieties, and Algorithms*,
Undergraduate Texts in Mathematics,
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After initial publication of the book, various errors were identified that needed correction. The following corrections have been updated within the current version, along with all known typographical errors.

Chapter 1

Page 23, part (c) of Exercise 5: "Adapt the argument given at the end of the section" should be "Adapt the argument used for the circle $x^2 + y^2 = 1$"

Page 24, line 1: "adapt the argument given at the end of the section" should be "adapt the argument used for the circle $x^2 + y^2 = 1$"

Page 39, line 6 of the paragraph beginning "To see why this algorithm works": "By (5)", should be "By (1),"

The updated online versions of these chapters can be found at
https://doi.org/10.1007/978-3-319-16721-3_1
https://doi.org/10.1007/978-3-319-16721-3_2
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Page 47, part (a) of Exercise 14: "where $h(a) \neq 0$" should be "where $r \geq 1$ and $h(a) \neq 0$"

Chapter 2

Page 63, bottom display, second line underneath $\overline{}$: "$xy^2 - x$" should be "$x^2y - x$"

Page 63, bottom display, fourth line underneath $\overline{}$: "$x^2y - y$" should be "$xy^2 - y$"

Page 66, lines -5 and -6: "[using condition (ii) of the definition of a monomial order]" should be "[using Lemma 8 of §2]"

Page 81, line 1 of Exercise 2: "$\text{LT}(I)$" should be "$\langle \text{LT}(I) \rangle$"

Page 82, last line of Exercise 13: "Exercise 14 of Chapter 1, §4" should be "Proposition 8 of Chapter 1, §4"

Page 89, part (d) of Exercise 5: "$z^2 - 3^z$" should be "$z^2 - 3z$"

Page 93, line -3: "$\langle \text{LT}(G \setminus \{p\}) \rangle$" should be "$\langle \text{LT}(G \setminus \{g\}) \rangle$"

Page 96, line 2 of part (a) of Exercise 12: "is not divisible by" should be "has leading term not divisible by"

Page 97, line 3 of Exercise 14: "$\dfrac{x_j - a_j}{a_i - a_j}$" should be "$\dfrac{x - a_j}{a_i - a_j}$"

Page 105, lines 13–16: Replace $xy + 1$ with $xy - 1$ in three places and $-x - y$ with $-x + y$ in two places. Thus the lines should be as follows:

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§3. If we divide $f = xy^2 - x$ by $G = (xy - 1, y^2 - 1)$, the division algortihm gives

$$xy^2 - x = y \cdot (xy - 1) + 0 \cdot (y^2 - 1) + (-x + y)$$

so that $\overline{f}^G = -x + y \neq 0$. Yet we can also write

$$xy^2 - x = 0 \cdot (xy - 1) + x \cdot (y^2 - 1),$$

Page 107, line -4: "$f_3 = xz + y - z + 1$" should be "$f_3 = xz - x + y + 1$"

Page 108, Exercise 1: "$f_3 = xz + y - z + 1$" should be "$f_3 = xz - x + y + 1$"

Page 110, Lemma 4: The statement of the lemma should be changed to the following:

Lemma 4. *Every element of $S(F)$ can be written as a sum of homogeneous elements of $S(F)$. Furthermore, this decomposition is unique.*

Page 115, line 12 "by Lemma 2" should be "by Lemma 2 of §9"

Chapter 3

Page 136, line 20: "$(t,u,x,y,z) \in \mathbf{V}(I) \subseteq \mathbb{R}^5$" should be "$(t,u,x,y,z) \in \mathbf{V}(I) \subseteq \mathbb{C}^5$"

Page 140, Exercise 3: "t^2 is always positive" should be "t^2 is always ≥ 0"

Page 154, part (c) of Exercise 15: The x-coordinate of the second displayed point should be

$$\pm\tfrac{1}{2}\sqrt{15 + 6\sqrt[3]{2} - 12\sqrt[3]{4}}$$

Page 160, part (b) of Exercise 4: "$g_{\mathrm{o}} = g_3$" should be "$g_{\mathrm{o}} = g_2$"

Page 167, line -17: Replace "It follows that" with "(Proposition 5 applies to f, g since their coefficients lie in the field $k(x_2, \ldots, x_n)$). It follows that"

Page 169, line -7: "$u_1(x_1)$" should be "$u(x_1)$"

Page 170, line 1: "$\langle f_i, f_* \rangle$" should be "$\langle f_i, f^* \rangle$"

Page 170, part (c) of Exercise 3: "part (a) is still true but part (b) can fail" should be "parts (a) and (b) are still true"

Page 171, line 2 of Exercise 9: "$l \geq m$" should be "$l \geq m > 0$"

Chapter 4

Page 180, line 13: "must have $f_i(a_1, \ldots, a_n) = 0$" should be "must have $f_i(a_1, \ldots, a_n) \neq 0$"

Page 181, lines 1 and 2 of Exercise 10: "$\mathbb{R}[x, y]$" should be "$\mathbb{R}[x, y, z]$" in two places.

Page 181, line 4 of Exercise 10: "same for $\mathbb{R}[x]$" should be "same for $\mathbb{R}[x]$ and $\mathbb{R}[x, y]$"

Page 187, line -3: "$a_1 \dfrac{\partial f_i}{\partial x_j} h_i$" should be "$a_i \dfrac{\partial f_i}{\partial x_j} h_i$"

Page 189, Exercise 15: Replace the hint with "Hint: Show that xy, xz, yz generate the ideal of leading terms of $\sqrt{I}$ and use the definition of Gröbner basis given in Chapter 2, §5."

Page 196, line 4: "principal ideals is principal)" should be "two principal ideals is principal)"

Page 206. Exercise 5: Replace the hint with "Hint: Examine the generators of J^{sM}."

Page 212, Exercise 10: "Theorem 11 implies" should be "Theorem 11 and Proposition 6 of §7 imply"

Page 221, line 1: "by Exercise 3 of Chapter 2, §9" should be "by Exercise 15"

Page 221, **Corollary 3**: "With the same notation" should be "With k algebraically closed and the same notation"

Page 222, line 4: "for all i" should be "for all such i"

Page 222, line 5 of **Proposition 5**: "a variety contained in V" should be "a variety contained in $\mathbf{V}(I_l)$"

Page 223, line -17: "$W \subsetneq \mathbf{V}(I)$" should be "$W \subsetneq \mathbf{V}(I_l)$"

Page 223, line -9: "fails for I, $\mathbf{V}(I)\backslash$" should be "fails for I, $\mathbf{V}(I_l)\backslash$"

Page 223, line -8: "by Proposition 4" should be "by Proposition 4 (we can assume G is reduced)"

Page 224, second display: The display should be as follows:

$$\mathbf{V}(I_1) \setminus \mathbf{V}(c_1) = \mathbb{C} \setminus \mathbf{V}(y) = \mathbb{C} \setminus \{0\} \subseteq \pi_1(\mathbf{V}(I)) \subseteq \mathbf{V}(I_1) = \mathbb{C}.$$

Page 228: Add the following new exercise:

15. In the setting of Theorem 2, prove that $\mathbf{x}^\gamma > \mathrm{LT}(f)$ implies $\mathbf{x}^\gamma > \mathrm{LT}(\bar{f})$ for $f \in k[\mathbf{x}, \mathbf{y}]$.

Page 231, line 9: "**EXERCISES FOR §9**" should be "**EXERCISES FOR §8**"

Page 231, part (b) of Exercise 11: "Exercise 4" should be "Exercise 6"

Page 231, Exercise 12: "Use Proposition 9 of §4" should be "Use Exercise 4 of §4"

Chapter 5

Page 247, line 1: "$R = k[x, t]$" should be "$R = k[t]$"

Page 247, line 2 of part (b) of Exercise 10: "$a, b \in k[x]$" should be "$a, b \in k$"

Page 256, Exercise 6: "Let $V = \mathbf{V}(x_3 - x_1^2, x_4 - x_1x_2, x_2x_4 - x_1x_5, x_4^2 - x_3x_5) \subseteq \mathbb{C}^5$" should be "Let $V = \mathbf{V}(I) \subseteq \mathbb{C}^5$ for $I = \langle x_3 - x_1^2, x_4 - x_1x_2, x_2x_4 - x_1x_5, x_4^2 - x_3x_5 \rangle \subseteq \mathbb{C}[x_1, x_2, x_3, x_4, x_5]$."

Page 256, line -1: At the end, add "Assume that the field k is infinite."

Page 257, part (e) of Exercise 11: "we developed in Chapter 1" should be "we developed in Chapter 1, §2"

Page 260, lines 2–4: These three lines

(iii) is proved in the same way as Theorem 11 of Chapter 4, §5. □

When k is algebraically closed, the Weak Nullstellensatz also holds in $k[V]$. You will prove this in Exercise 16.

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should be replaced with the following:

(iii) is proved by first showing that the Weak Nullstellensatz also holds in $k[V]$. You will prove this in Exercise 16. From here, one proceeds in the same way as Theorem 11 of Chapter 4, §5. □

Page 271, line following second display: "$\mathbf{V}_W(a^2 - b^2 + 4)$" should be "$\mathbf{V}_W(y^2 - z^2 + 4)$"

Page 272, second paragraph of the proof of **Proposition 6**: In two places, "$\mathbf{V}(f_i g_i' - f_i' g_i)$" should be "$\mathbf{V}_V(f_i g_i' - f_i' g_i)$"

Page 279, display (1): Replace the display with

$$s^\ell + c_1 s^{\ell-1} + \cdots + c_\ell = 0, \quad c_1, \ldots, c_\ell \in R. \tag{1}$$

Page 279, line -10: "$a_{i\ell}\, s_{i\ell}$" should be "$a_{i\ell}\, s_\ell$"

Page 279, line -7: "the coefficient of x is" should be "the coefficient of x^ℓ is"

Page 279, the last display should be:

$$\det(A - xI_\ell) = (-1)^\ell (x^\ell + c_1 x^{\ell-1} + \cdots + c_\ell).$$

Page 279, line -4: "$a_i \in R$" should be "$c_i \in R$"

Page 280, line 4: "C has entries in R" should be "C has entries in S"

Page 280, line -13: "(ii) $\Rightarrow$ (iii)" should be "(i) $\Rightarrow$ (iii)"

Page 280, line -9: "divide f by G" should be "divide f by a Gröbner basis G"

Page 282, line -6: "finite over $k[y]$" should be "finite over $k[y_1, \ldots, y_m]$"

Page 288, line 2 of Exercise 6: "means geometrically" should be "means geometrically when k is algebraically closed"

Page 288, line 1 of Exercise 13: "in (4) is" should be "in (5) is"

Page 288, line 2 of part (a) of Exercise 13: "the substitution (5)" should be "the substitution (4)"

Page 289, last line of part (a) of Exercise 17: "$\phi(\mathbf{V}(J))$" should be "$\pi(\mathbf{V}(J))$"

Chapter 6

Page 294, line below second display: "$C = U \times V$" should be "$\mathcal{C} = U \times V$"

Page 300, first display: "$f(\theta_1 + \theta_2 + \theta_3)$" should be "$f(\theta_1, \theta_2, \theta_3)$"

Page 302, line 2: "$\mathcal{J} = \mathbf{V}(x_1^2 + y_1^2 - 1, x_2^2 + y_2^2 - 1, x_3^2 + y_3^2 - 1)$" should be "$\mathcal{J} = \mathbf{V}(c_1^2 + s_1^2 - 1, c_2^2 + s_2^2 - 1, c_3^2 + s_3^2 - 1)$"

Page 302, two lines below (7): "$V = \mathbf{V}(x_1^2+y_1^2-1, x_2^2+y_2^2-1, x_3^2+y_3^2-1)$" should be "$V = \mathbf{V}(c_1^2+s_1^2-1, c_2^2+s_2^2-1, c_3^2+s_3^2-1)$"

Page 304, part (a) of Exercise 9: "result of part (c)" should be "result of part (e)"

Page 305, line 12: "in equation (7) of §2" should be "in equation (6) of §2"

Page 305, line 1 of (2): "$\dfrac{2bl_2l_3}{2l_2(a^2+b^2)}s_2$" should be "$\dfrac{bl_2l_3}{l_2(a^2+b^2)}s_2$"

Page 305, line 2 of (2): "$\dfrac{2al_2l_3}{2l_2(a^2+b^2)}s_2 +$ " should be "$\dfrac{al_2l_3}{l_2(a^2+b^2)}s_2 -$ "

Page 306, line 1 of (3): "$\dfrac{2b}{2(a^2+b^2)}s_2$" should be "$\dfrac{b}{a^2+b^2}s_2$"

Page 306, line 2 of (3): "$\dfrac{2a}{2(a^2+b^2)}s_2 +$ " should be "$\dfrac{a}{a^2+b^2}s_2 -$ "

Page 307, line -3: "when $a^2+b^2<4$," should be "when $0<a^2+b^2<4$,"

Page 308, line 6: "if l_4 lies in" should be "if $l_2=l_3=1$ and l_4 lies in"

Page 308, line 8 of the subsection *Specialization of Gröbner Bases*: "$k[x_1,\dots,x_m, t_1,\dots,t_m]$" should be "$k[x_1,\dots,x_n,t_1,\dots,t_m]$"

Page 309, display in the middle of the page: Replace the display with

$$1,\ l_2,\ l_3,\ l_2,\ l_3,\ 1,\ l_2l_3,\ l_2l_3,\ l_2l_3,\ a,\ b,\ a^2+b^2,\ l_2l_3.$$

Page 309, two lines below display: "a, b, l_2, l_3, a^2+b^2 and $a^2+b^2-l_2^2-l_3^2$ are nonzero" should be "a, b, l_2, l_3 and a^2+b^2 are nonzero"

Page 312, line 3: "We have" should be "When $l_2=l_3=1$, we have"

Page 316, line 5: "$B_{ij}\in k(\mathbf{t})[\mathbf{x}]$" should be "$B_{ji}\in k(\mathbf{t})[\mathbf{x}]$"

Page 316, part (c) of Exercise 7: Replace the hint with "Hint: The monomial orders for $k(\mathbf{t})[\mathbf{x}]$ and $k[\mathbf{x}]$ are the same—the parameters t_j are "constants" as far as the ordering is concerned. Theorem 6 of Chapter 2, §9 will be useful."

Page 316, lines 7 and 8 of Exercise 8: Delete these lines and replace them with the following:

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nonzero polynomials F_i and G_j in $k[\mathbf{t}]$, we get

$$\tilde{f}_i = F_i f_i,\ \tilde{g}_j = G_j g_j \in k[\mathbf{x},\mathbf{t}].$$

Page 316, line 9 of Exercise 8: "$\tilde{I}\subseteq k(\mathbf{t})[\mathbf{x}]$" should be "$\tilde{I}\subseteq k[\mathbf{x},\mathbf{t}]$"

Page 316, part (a) of Exercise 8: Replace part (a) with the following:

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a. Fix j and suppose $g_j = \sum_{i=1}^{s} B_{ji} f_i$ in $k(\mathbf{t})[\mathbf{x}]$ and let $d_j \in k[\mathbf{t}]$ be a polynomial that clears the denominators of $B_{j1}, \ldots, B_{js}$. Also let $F = \operatorname{lcm}(F_1, \ldots, F_s)$. Then prove that

$$d_j \in (\tilde{I} : F\tilde{g}_j) \cap k[\mathbf{t}],$$

where $\tilde{I} : F\tilde{g}_j$ the ideal quotient as defined in §4 of Chapter 4.

Page 316, part (b) of Exercise 8: "$(\tilde{I} : \tilde{g}_j) \cap k[\mathbf{t}]$" should be "$(\tilde{I} : F\tilde{g}_j) \cap k[\mathbf{t}]$"

Page 317, part (b) of Exercise 11: "$c_i \in \mathbb{R}[a, b, l_2, l_3]$" should be "$h_i \in \mathbb{R}[a, b, l_2, l_3]$"

Page 326, line 4 of the first display should be:

$$f_4 = x_3u_3 + x_4u_1 - x_4u_2 - u_1u_3,$$

Page 331, part (b) of Exercise 2: Replace with "b. With this choice, explain why we can specify the coordinates of B as $B = (u_3, 0)$, i.e., the x-coordinate of B is arbitrary, but the y-coordinate is zero."

Page 332, Exercise 10: "made in Example 1" should be "made in the continuation of Example 1"

Page 332, line -1: "reducible components" should be "irreducible components"

Page 333, line 2 of part (e) of Exercise 14: "follows from part (a)" should be "follows from part (b)"

Page 333, line 2 of part (e) of Exercise 14: "$(c \cdot g)$'s" should be "$(c \cdot g)^s$"

Page 333, line 3 of part (c) of Exercise 15: "show that $\overline{c}$ has" should be "show that $c\overline{c}$ has"

Page 336, lines 6-7: Interchange the order of these two lines. Thus the line "$q := \cdots$" should be above the lines "$r := \cdots$"

Chapter 7

Page 348, line -6: "$\mathrm{LT}(\sigma_1\sigma)$" should be "$\mathrm{LT}(\sigma_1\sigma_2)$"

Page 354, first display of Exercise 11: "$h_{j-i}(x_k, \ldots, x_n)$" should be "$h_{j-i}(x_j, \ldots, x_n)$"

Page 355, line 1 of the display in Exercise 15: "$+ (-1)^{j-1}\sigma_{k-1}x_i + (-1)^j\sigma_k =$" should be "$+(-1)^{j-1}\sigma_{j-1}x_i + (-1)^j\sigma_j =$"

Page 355, display of Exercise 18: "$= s_j = \sigma_1 s_{j-1} +$" should be "$= s_j - \sigma_1 s_{j-1} +$"

Page 356, line 7: "every linear map" should be "every invertible linear map"

Page 361, second display of **Example 13**: Replace with the following:

$$x^i y^j = \begin{cases} x^{2m}y^{2l} = (x^2)^m(y^2)^l & \text{if } i,j \text{ are even} \\ x^{2m+1}y^{2l+1} = (x^2)^m(y^2)^l xy & \text{if } i,j \text{ are odd.} \end{cases}$$

Page 362, Exercise 6: "$k[x,y,z]^G$" should be "$\mathbb{R}[x,y,z]^G$" in part (d) and again in part (e)

Page 362, part (a) of Exercise 7: "$k[x,y,z]^G$" should be "$\mathbb{R}[x,y,z]^G$"

Page 363, second line of the first display: The third factor of g should be "$(x-y+z)$"

Page 363, part (b) of Exercise 7: "$k[x,y,z]^G$" should be "$\mathbb{R}[x,y,z]^G$" twice one line below the display, once two lines below the display, and once three lines below the display

Page 364, part (b) of Exercise 14: "Use the method of Exercise 13" should be "Use the method of Exercise 12"

Page 367, line -1: At the end of the display, "$\sum_{|\beta|=|G|} R_G(x^\beta)u^\beta$" should be "$\sum_{|\beta|=|G|} b_\beta R_G(x^\beta)u^\beta$"

Page 372, part (b) of Exercise 8: "use Exercise 6 and §2" should be "use Exercise 6 and Example 13 of §2"

Page 382, part (c) of Exercise 2: "Use Exercise 13" should be "Use Exercise 16"

Page 382, line 2 of Exercise 9: "$b = A \cdot \mathbf{a}$" should be "$\mathbf{b} = A \cdot \mathbf{a}$"

Page 383, line 2 of Exercise 12: "$G \cdot \mathbf{b} \cup G \cdot \mathbf{a} - \{\mathbf{a}\}$" should be '$(G \cdot \mathbf{b} \cup G \cdot \mathbf{a}) \setminus \{\mathbf{a}\}$"

Page 383, line 2 of Exercise 16: "as in Definition 1 of" should be "as in Definition 2 of"

Chapter 8

Page 394, Exercise 7: "the map (2)" should be "the map (1)"

Page 399, line -4: "ψ" should be "ϕ" in two places

Page 399, line -2: "$(1 : a_1 : \cdots : a_n)$" should be "$\phi(a_1,\ldots,a_n) = (1 : a_1 : \cdots : a_n)$"

Page 404, line 5: "$1 \le i_1 <$" should be "$0 \le i_1 <$"

Page 404, line 2 of Exercise 9: "$f_i \in k[x_0,\ldots,x_n]$" should be "$f_j \in k[x_0,\ldots,x_n]$"

Page 410, line -1: "$k[x_1,\ldots,x_n]$" should be "$k[x_0,\ldots,x_n]$"

Page 414, part (b) of Exercise 13: "$V \setminus V \cap \mathbf{V}(g)$" should be "$V \setminus (V \cap \mathbf{V}(g))$"

Page 416, line 2 of **Lemma 5**: "$\mathrm{LM}_{>h}(f^h)$" should be "$\mathrm{LM}_{>_h}(f^h)$"

Page 416, line -4: "$\mathrm{LM}_{>h}(f^h)$" should be "$\mathrm{LM}_{>_h}(f^h)$"

Page 417, equation (2): "$\mathrm{LM}_{>h}(f^h)$" should be "$\mathrm{LM}_{>_h}(f^h)$"

Page 417, two lines below equation (2): "$\mathrm{LM}_{>h}(g_i^h)$" should be "$\mathrm{LM}_{>_h}(g_i^h)$"

Page 419, second sentence of the proof of **Theorem 8**: The sentence should be "Applying the proof of part (i) of Proposition 7 with I in place of $\mathbf{I}_a(W)$ shows that Z is a projective variety containing W."

Page 425, first line following fourth display: "trivial solutions $(0:0;y)$" should be "trivial solutions $(0,0,y)$"

Page 429, line -1: "This proves $f \in I^{(0)} \cap \cdots \cap I^{(n)}$" should be "This proves $f \in I_n^{(0)} \cap \cdots \cap I_n^{(n)}$"

Page 430, line 17: "Now suppose $f \in I^{(i)}$" should be "Now suppose $f \in I_n^{(i)}$"

Page 430, line 20: "$f \in I^{(0)} \cap \cdots \cap I^{(n)}$" should be "$f \in I_n^{(0)} \cap \cdots \cap I_n^{(n)}$"

Page 431, line 2 of the proof of **Proposition 8**: "Then the proof of Proposition 7" should be 'Then Proposition 7"

Page 432, line -1: "point in $\mathbb{P}^n$" should be "point in $\mathbb{P}^m$"

Page 433, line -12: "all have weight d" should be "are all weighted homogeneous of weight d"

Page 443, line below display (9): "σ suppose that" should be "suppose that"

Page 445, first display: "$\begin{pmatrix} a_0 & a_1 & a_2 & a_3 \\ b_0 & b_1 & b_1 & b_3 \end{pmatrix}$" should be "$\begin{pmatrix} a_0 & a_1 & a_2 & a_3 \\ b_0 & b_1 & b_2 & b_3 \end{pmatrix}$"

Page 446, line -3: "$w_{ij} = \lambda w'_{ij}$." should be "$w'_{ij} = \lambda w_{ij}$"

Page 447, line 5: "through two points" should be "through two distinct points"

Page 447, line 10: "are nonzero, and, hence, determine a line L" should be "are nonzero and distinct, and, hence, determine a unique line L"

Page 448, part (a) of Exercise 5: "$\sum_{i,j=0}^n a_{ij} x_i x_i$" should be "$\sum_{i,j=0}^n a_{ij} x_i x_j$"

Page 448, line 1 of Exercise 9: "be nonzero" should be "be nonzero with $Q = (a_{ij})$ symmetric"

Page 449, line 3 of Exercise 10: "set of all lines" should be "union of all projective lines"

Page 449, part (a) of Exercise 13: At the end of line 2, add "The image of F is called a *projective line* in $\mathbb{P}^n$."

Page 450, line 5: "$V \subseteq \mathbb{P}^4$" should be "$V \subseteq \mathbb{P}^9$"

Page 453, line -6: "nonzero" should be "nonconstant"

Page 456, line 7: "$f = b_0 z^m + \cdots$" should be "$f = a_0 z^m + \cdots$"

Page 456, line 8: "$b_0 \in \mathbb{C} \setminus \{0\}$" should be "$a_0 \in \mathbb{C} \setminus \{0\}$"

Page 464, part (a) of Exercise 5: "nonzero polynomial" should be "nonconstant polynomial"

Chapter 9

Page 472, line 4 of part (b) of Exercise 4: Add "(This is a challenging exercise.)"

Page 481, lines -7 and -6: "It is easy to generalize this argument and show" should be "By using the discussion following Lemma 4, one can show"

Page 496, Exercise 7: "${}^aHF_I(s) = {}^aHP_I(s)$" should be "${}^aHF_{R/I}(s) = {}^aHP_{R/I}(s)$"

Page 496, part (c) of Exercise 10: "with Theorem 15 of Chapter 4, §3" should be "with Proposition 1 of §1"

Page 497, part (c) of Exercise 13: "Lemma 5 of §2" should be "Lemma 4 of §2"

Page 506, part (a) of Exercise 14: "part (a) of the proposition" should be "part (i) of the proposition"

Page 506, part (b) of Exercise 14: "part (b) of the proposition" should be "part (ii) of the proposition"

Page 514, part (a) of Exercise 10: "If $f_1, \ldots, f_s \in k[x_1, \ldots, x_n]$" should be "If $f, f_1, \ldots, f_s \in k[x_1, \ldots, x_n]$"

Page 535, line -1: "$k \geq N$" should be "$i \geq N$"

Page 536, line 5: "$W \subset$" should be "$W \subseteq$"

Page 536, line 1 of Exercise 13: "$W \subset$" should be "$W \subseteq$"

Page 537, line 4 of part (d) of Exercise 14: "a curve $L \subseteq \Gamma$" should be "a curve $\widetilde{L} \subseteq \Gamma$"

Page 537, hint to part (b) of Exercise 15: "$\mathrm{BL}_0 V$" should be "$\mathrm{Bl}_0 V$"

Page 537, part (b) of Exercise 16: "$g(q, tq) = 0$" should be "$g(tq, q) = 0$"

Page 537, part (c) of Exercise 16: "$g(q, tq) = 0$" should be "$g(tq, q) = 0$"

Chapter 10

Page 549, part (a) of Exercise 7: "matrix M_3 in (3)" should be "matrix M_3 in (5)"

Page 549, line 2 of part (e) of Exercise 7: The line should be "$x > y > z$ and explain its relation to the matrix N_2 in Example 8."

Page 559, line 21: "$HF_{S/\langle \mathrm{LT}(G)\rangle}(m') < HF_{S/I}(m')$" should be "$HF_{S/\langle \mathrm{LT}(G)\rangle}(m') > HF_{S/I}(m')$"

Page 564, line 3: "$-v^2+\xi^2-\zeta^2$" should be "$v^2-\xi^2+\zeta^2$"

Page 564, line 10: "$-u\eta^2+v\zeta^2$" should be "$u\eta^2-v\zeta^2$"

Page 564, line 12: "$-u\xi^2+u\zeta^2+v\eta^2$" should be "$u\xi^2-u\zeta^2-v\eta^2$"

Page 564, fourth display: "$-\xi^2\zeta^2+\eta^4+\zeta^4$" should be "$\xi^2\zeta^2-\eta^4-\zeta^4$"

Page 564, sixth display: "$-xz+y^2+z^2$" should be "$xz-y^2-z^2$"

Page 570, first display: On the left, "$\dfrac{\mathrm{lcm}(\mathrm{LM}(f_i),\mathrm{LM}(f_j)}{\mathrm{LT}(f_j)}$" should be "$\dfrac{\mathrm{lcm}(\mathrm{LM}(f_i),\mathrm{LM}(f_j))}{\mathrm{LT}(f_i)}$" (two errors)

Page 578, line 3 of first display: "xy" should be "$-xy$"

Page 578, line -1: in two places, "$(xy$" should be "$(-xy$"

Page 579, line before last display: "$-xy+y^2$" should be "$xy+y^2$"

Page 582, line 2 of **Example 6**: "$f_2=xy^2-xy$" should be "$f_2=xy^2+xy$"

Page 582, first display of **Example 6**: "$-x(xy^2-xy)$" should be "$-x(xy^2+xy)$"

Page 582, line after first display of **Example 6**: "equal to $\mathrm{LT}(f_1)$" should be "equal to $-\mathrm{LT}(f_1)$"

Page 582, third display: "$\mathfrak{s}(\mathbf{g})=x\mathbf{e}_2$" should be "$\mathfrak{s}(\mathbf{g})=-x\mathbf{e}_2$"

Page 585, line above the second display: "$y\mathbf{e}_1-x\mathbf{e}_1$" should be '$y\mathbf{e}_1-x\mathbf{e}_2$"

Page 585, line below the second display: "$\mathfrak{s}(\mathbf{h})=x^2\mathbf{e}_2$ divides $\mathfrak{s}(\mathbf{k})$" should be "$\mathfrak{s}(\mathbf{k})=x^2\mathbf{e}_2$ divides $\mathfrak{s}(\mathbf{h})$"

Page 585, line below the second display: "a a" should be "a"

Page 586, first line of pseudocode: "$f_i\in R$" should be "$f_i\in R, f_i$ monic"

Page 590, part (c) of Exercise 1: On the first line, "order on S" should be "order on R"

Page 590, part (c) of Exercise 1: On the second line, "$>$" should be "$>_{POT}$"

Page 590, part (b) of Exercise 2: Replace with "If we allow $\mathfrak{s}$-reductions and reduction by the syzygy $\mathbf{h}=(-f_2,f_1)$, then show that we can reduce $\mathbf{g}$ to $(0,0)$."

Page 590, part (c) of Exercise 2: Replace with "Use Propositions 12 and 14 to explain why the computations in parts (a) and (b) are unnecessary."

Page 591, line 10 of the pseudocode in Exercise 5: "$<$" should be "$<_{POT}$"

Page 597, line -10 "Cramer's Rule" should be "Cramer's rule"