Ideals, Varieties and Algorithms, *third edition*

Errata for **first** printing can be found in two files:
• This file, which lists the errors corrected in the second printing, and
• The files `3ed2.ps` or `3ed2.pdf`, which list errors present in the first and second printings.

September 4, 2008

Page ii, entry for **Cox/Little/O'Shea**: delete "(2007)"

Page iv, address for John Little: "Department of Mathematics" should be "Department of Mathematics and Computer Science"

Pages viii, x and xi, last line: "O' Shea" should be "O'Shea" (no space before S)

Page 7, line 3: "$\mathbf{V}(z-x^2-y)$" should be "$\mathbf{V}(z-x^2-y^2)$"

Page 25, line 10: "part c" should be "part (c)"

Page 25, line 7 of Exercise 9: "at the top of the next page." should be "below."

Page 27, line 6 of Exercise 11: "part d" should be "part (d)"

Page 31, first line of fourth display: "$(x-1)^2-t=0$," should be "$(x-1)^2-t^2=0$,"

Page 42, item (i) of **Proposition 6**: "GCD (f,g)" should be "GCD(f,g)" (no space)

Page 42, item (ii) of **Proposition 6**: "GCD (f,g)" should be "GCD(f,g)" (no space)

Page 44, line 3 of **Definition 7**: "*(i)*" should be "(i)"

Page 44, line 4 of **Definition 7**: "*(ii)*" should be "(ii)"

Page 44, line 2 of **Proposition 8**: "*(i)*" should be "(i)"

Page 44, line 4 of **Proposition 8**: "*(ii)*" should be "(ii)"

Page 44, line 5 of **Proposition 8**: "*(iv)*" should be "(iii)"

Page 44, line 6 of **Proposition 8**: "*(iv)*" should be "(iv)"

Page 53, line 5 of Exercise 3: "x_3-t+6" should be "$x_3=-t+6$"

Page 53, line -2: "part b" should be "part (b)"

Page 55, line 1 of **Definition 1**: "on $k>[x_1,\dots,x_n]$" should be "$>$ on $k[x_1,\dots,x_n]$"

Page 55, line 4 of **Definition 1**: "$a > \beta$" should be "$\alpha > \beta$"

Page 56, line 3: " "has no least" should be "has no least" (remove " in front of the word "has")

Page 58, line 2: "$\mu_{i=1}^n \beta_i$" should be "$\sum_{i=1}^n \beta_i$" and $|\alpha| - |\beta|$" should be $|\alpha| = |\beta|$"

Page 59, line 1: "x^5yz^2" should be "x^5yz"

Page 59, line 15: "$f = \sum_\alpha a_\alpha X^\alpha$" should be "$f = \sum_\alpha a_\alpha x^\alpha$"

Page 63, line 2: "$\mathrm{LT}(f^2)$" should be "$\mathrm{LT}(f_2)$"

Page 64, line -15: "$\mathrm{LT}(f_i)$ divides (p)" should be "$\mathrm{LT}(f_i)$ divides $\mathrm{LT}(p)$"

Page 66, line 7 of **Example 4**, immediately under the horizontal line: "$x^2y + xy^2 - y^2$" should be $x^2y + xy^2 + y^2$"

Page 68, line 1 of Exercise 5: "$f^2 = xy - 1$" should be "$f_2 = xy - 1$"

Page 69, line 8 of Exercise 11: "$\Delta_1 = (\alpha(s) + \mathbb{Z}^n_{\geq 0}) -$" should be "$\Delta_s = (\alpha(s) + \mathbb{Z}^n_{\geq 0}) -$"

Page 69, line 15 of Exercise 11: "but $x^{\alpha(i)}$ no with" should be "but no $x^{\alpha(j)}$ with" (two errors)

Page 70, line 3: "$\langle x^a : \alpha \in A \rangle$" should be "$\langle x^\alpha : \alpha \in A \rangle$"

Page 70, line 1 of **Lemma 2**: "$\langle x^a : \alpha \in A \rangle$" should be "$\langle x^\alpha : \alpha \in A \rangle$"

Page 70, line 2 of **Lemma 2**: "*by x^a for*" should be "*by x^α for*"

Page 70, line 4 of the proof of **Lemma 2**: "some $x^{a(i)}$" should be "some $x^{\alpha(i)}$"

Page 70, line 14: "divisible by x^a" should be "divisible by x^α"

Page 70, line 19: "$I = (x^4y^2, x^3y^4, x^2y^5)$" should be "$I = \langle x^4y^2, x^3y^4, x^2y^5 \rangle$"

Page 71, line 2 of the proof of **Theorem 5**: "Let $\beta \leq \alpha$ be" should be "Let β be"

Page 72, line 3: "$x^{\alpha(1)}$" should be "$x^{\alpha_0(1)}$"

Page 72, second display: insert a comma at the end of the first line of the display

Page 72, line -11: "ideal description" should be "ideal description problem"

Page 74, line -10 (part (b) of Exercise 11): "$\mathbb{Z}^3_{\geq 0}$" should be "$\mathbb{Z}^2_{\geq 0}$"

Page 74, line -6: "$>_{gervlex}$" should be "$>_{grevlex}$"

Page 74, line -4: "$\mathbf{u} \cdot \alpha\beta$" should be "$\mathbf{u} \cdot \alpha = \mathbf{u} \cdot \beta$"

Page 75, line 3 of §5: "§$\dot{3}$" should be "§3"

Page 76, line 3 of proof of **Proposition 3**: "$\langle \text{LT}(I)$ (see" should be "$\langle \text{LT}(I) \rangle$ (see"

Page 76, line -6: "$\langle g_1, \ldots, g_t \rangle$" should be "$(g_1, \ldots, g_t)$"

Page 77, line 7: "$\langle \text{LT}(g_i), \ldots, \text{LT}(g_i) \rangle$" should be "$\langle \text{LT}(g_1), \ldots, \text{LT}(g_t) \rangle$"

Page 79, line 5: "$g \in I_i$" should be "$g \in I_j$"

Page 79, line 11: "$f_i \in I_{ji}$" should be "$f_i \in I_{j_i}$"

Page 79, line -5: "$f \in \mathbf{I}$" should be "$f \in I$"

Page 80, lines 2 and 3: "$f_i \in \mathbf{I}$" and "$f \in \mathbf{I}$" should be "$f_i \in I$" and "$f \in I$" (two errors)

Page 83, line 2: "$\langle \text{LT}(g_t), \ldots, \text{LT}(g_t) \rangle$" should be "$\langle \text{LT}(g_1), \ldots, \text{LT}(g_t) \rangle$"

Page 83, line 3 of **Definition 3**: "*Proposition I*" should be "*Proposition 1*"

Page 83, line 18: "$(x^2 - y^2)$" should be "$(x^2y - y^2)$"

Page 83, line 3 of **Definition 4**: "$\max(\alpha, \beta_i)$" should be "$\max(\alpha_i, \beta_i)$"

Page 84, line -11: "of $\text{LT}(f_j)$" should be "of $\text{LM}(f_j)$"

Page 87, line 19: "$\overline{S(y - x^2, z - x^3)}$" should be "$\overline{S(y - x^2, z - x^3)}^G$"

Page 88, line -5: "$\overline{f_g}^G = \overline{\overline{g}^G \cdot \overline{g}^G}^G$" should be "$\overline{fg}^G = \overline{\overline{f}^G \cdot \overline{g}^G}^G$" (two errors)

Page 89, line 6: "$(x^3 - 2xy, x^2y - 2y^2 + x)$" should be "$\langle x^3 - 2xy, x^2y - 2y^2 + x \rangle$"

Page 91, line 1: "Bucherger" should be "Buchberger"

Page 91, line 2 of the proof of **Lemma 3**: "if follows" should be "it follows"

Page 93, display (3), second row of the matrix: "0 0 0 3" should be "0 0 1 3"

Page 95, line 1 of part (a) of Exercise 10: "$(g_1, \ldots, g_t)$" should be "$\langle g_1, \ldots, g_t \rangle$"

Page 96, second display: "$G = (\cdots) = (\cdots)$." should be "$G = \{\cdots\} = \{\cdots\}$."

Page 103, line 1 of **Definition 1**: "$\{g_1, \ldots, g_s\}$" should be "$\{g_1, \ldots, g_t\}$"

Page 103, line 1 of **Lemma 2**: "$(g_1, \ldots, g_s)$" should be "$\{g_1, \ldots, g_t\}$" (three errors)

Page 103, line -2: "Definition I" should be "Definition 1"

Page 104, line 1: "$\{g_1, \ldots, g_s\}$" should be "$\{g_1, \ldots, g_t\}$"

Page 104, line 3: "$\overline{S(g_i, g_i)}^G$" should be "$\overline{S(g_i, g_j)}^G$"

Page 104, line -7: "multideg$(S(f,g))\max(\text{multideg}(p\cdot g),\text{multideg}(q\cdot f))$" should be "multideg$(S(f,g)) = \max(\text{multideg}(p\cdot g),\text{multideg}(q\cdot f))$"

Page 105, line -3: "$\{f_i, f_i\}$" should be "$\{f_i, f_j\}$"

Page 106, line 4 of **Definition 6**: "$=, \alpha$" should be "$= \alpha$"

Page 106, line 3 of the proof of **Lemma 7**: "in the $\sum_{i=1}^{s} h_j \text{LT}(f_i)$" should be "in the sum $\sum_{i=1}^{s} h_i \text{LT}(f_i)$"

Page 106, line -5: "$\alpha(j)+\text{multideg}(f_i)$" should be "$\alpha(j)+\text{multideg}(f_j)$"

Page 106, line -4: "LCM$(\text{LM}((f_i), \text{LM}(f_i))$" should be "LCM$(\text{LM}(f_i), \text{LM}(f_j))$" (two errors)

Page 106, line -3: "$\dfrac{x^\gamma}{\text{LM}(f_t)} e_j$" should be "$\dfrac{x^\gamma}{\text{LM}(f_j)} e_j$"

Page 108, line -4: "LCM$(\text{LT}(g_i), \text{LT}(g_i))$" should be "LCM$(\text{LT}(g_i), \text{LT}(g_j))$"

Page 109, line -14: "LCM$(\text{LT}(f_i), \text{LT}(f_i))$" should be "LCM$(\text{LT}(f_i), \text{LT}(f_j))$"

Page 121, line 7 of Exercise 2: "smallest field k" should be "smallest field k containing $\mathbb{Q}$"

Page 122, line 8: "$>_{grevles}$" should be "$>_{grevlex}$"

Page 123, first display: "π_i" should be "π_l"

Page 123, line 2 of **Lemma 1**: "$\mathbb{C}^{n-1}$" should be "$\mathbb{C}^{n-l}$"

Page 123, line -5: "with $(\cdots)) \in V$" should be "with $(\cdots) \in V$"

Page 124, line 4 of **Theorem 2**: "$\mathbf{V}(I_l)$" should be "$\mathbf{V}(I_1)$"

Page 125, part (i) of **Theorem 3**: "$\mathbb{C}^{n-1}$" should be "$\mathbb{C}^{n-l}$"

Page 125, part (ii) of **Theorem 3**: "$V(I_l)$" should be "$\mathbf{V}(I_l)$" (two errors)

Page 125, line 4 of the proof of **Theorem 3**: "$\mathbb{C}^{n-1}$" should be "$\mathbb{C}^{n-l}$"

Page 125, line -18: "$\pi_1(V) \cup (\mathbf{V})(g_1,\ldots,g_s) \cap \mathbf{V}(I_1))$" should be "$\pi_1(V) \cup (\mathbf{V}(g_1,\ldots,g_s) \cap \mathbf{V}(I_1))$"

Page 125, line -15: "$W \neq \mathbf{V}(I_l)$" should be "$W \neq \mathbf{V}(I_1)$"

Page 125, line -9: "$\mathbf{V}(f1,\ldots,f_s) = V$" should be "$\mathbf{V}(f_1,\ldots,f_s) = V$"

Page 125, line -5: "the ideal $\langle (f_1,\ldots,f_s,$" should be "the ideal $\langle f_1,\ldots,f_s,$"

Page 126, line 4: "New set" should be "Now set"

Page 127, line 1: "$\mathbb{C}^{n-1}$" should be "$\mathbb{C}^{n-l}$"

Page 127, line 4 of **Corollary 4**: "$c \in \mathbb{C}$ s" should be "$c \in \mathbb{C}$ is"

Page 129, first display: "$x_n = f_n(t_1, \ldots, t_n)$." should be "$x_n = f_n(t_1, \ldots, t_m)$."

Page 129, display (3): the label "(3)" needs to be raised so that it is midway between the lines beginning "This gives us ..." and "Note that ...". (See page 126 of the second edition.)

Page 131, line 4: "$Z - t^3 - 3t^2u$" should be "$z - t^3 - 3t^2u$"

Page 133, first display: the label "(7)" needs to be raised so that it is midway between the lines beginning "We can adapt ..." and "It is easy ...". (See page 129 of the second edition.)

Page 133, third display: "$J : k^m - W \longrightarrow k^{n+m+1}$," should be "$j : k^m - W \longrightarrow k^{n+m+1}$,"

Page 133, second display from bottom: In two places, the numeral one needs to be in roman font. Thus "$k^{n+m+\mathit{1}}$" should be "k^{n+m+1}" and "$\pi_{m+\mathit{1}}$" should be "π_{m+1}"

Page 134, line 1 of the first display: "$g_1x_1 = f_1$" should be "$g_1x_1 = f_1,$" (insert comma)

Page 136, part (a) of Exercise 12: "$\langle (x^2y - z^3)\rangle$" should be "$\langle z(x^2y - z^3)\rangle$"

Page 140, third display: "$\frac{\partial}{\partial x} f(a, ct, b + dt)$" should be "$\frac{\partial}{\partial x} f(a + ct, b + dt)$"

Page 142, line 2 of **Definition 4**: "$\mathbf{V}(F_1)$" should be "$\mathbf{V}(F_t)$"

Page 143, line -5: "$(f(t), g(t)$" should be "$(f(t), g(t))$"

Page 143, line -3: "$t \ \in \mathbb{R}$" should be "$t \in \mathbb{R}$" (too much space between t and $\in$)

Page 146, line -6: "$\frac{\partial}{\partial y} g_1$.(see §8 of Chapter 2). The second line of(14)is treated" should be "$\frac{\partial}{\partial y} g_1$ (see §8 of Chapter 2). The second line of (14) is treated" (two errors: remove the unwanted period and add spaces around "(14)")

Page 147, line 6: "Extension. Theorems." should be "Extension Theorems" (remove period after "Extension")

Page 147, line 6 of Exercise 2: "nonzero real number λ" should be "nonzero number $\lambda \in k$"

Page 148, line 1 of Exercise 5: Add the new sentence "Assume that $\mathbb{Q} \subset k$."

Page 149, line -3: "$(\pm\sqrt{15 + 6\sqrt[3]{2} - 12\sqrt[3]{4}, \frac{1}{4}(-1 + 6\sqrt[3]{2})})$" should be "$(\pm\sqrt{15 + 6\sqrt[3]{2} - 12\sqrt[3]{4}}, \frac{1}{4}(-1 + 6\sqrt[3]{2}))$"

Page 150, line 1 of part (a) of Exercise 20: "$F = \frac{\partial}{\partial x} F = \frac{\partial}{\partial y} = 0$" should be "$F = \frac{\partial}{\partial x} F = \frac{\partial}{\partial y} F = 0$"

Page 152, line 9: "in $k(x_2, \ldots, x_n)$" should be "in $k[x_2, \ldots, x_n]$"

Page 152, line 9: "regard $k(x_1, \ldots, x_n)$" should be "regard $k[x_1, \ldots, x_n]$"

Page 153, line 3: “$h \in$” should be “$\tilde{h} \in$”

Page 154, line 7 of the proof of **Lemma 6**: “If and g have” should be “If f and g have”

Page 155, lowest entry in the first column of the large matrix: “a_1” should be “a_l”

Page 155, second entry in the last column of the large matrix: “$b_{1,}$” should be “b_1”

Page 156, line -3: “Res (f,g,x)” should be “$\mathrm{Res}(f,g,x)$” (no space after “Res”)

Page 157, line 17: “$\widetilde{A} = d_0x^{l-1} + \cdots + d_{l-1}$” should be “$\widetilde{B} = d_0x^{l-1} + \cdots + d_{l-1}$”

Page 158, first display: Replace the matrix

$$\begin{pmatrix} 0 & & & b_0 & & \\ 0 & a_0 & & \vdots & \ddots & \\ \vdots & \vdots & \ddots & \vdots & & b_0 \\ 0 & a_l & & a_0 & b_m & \vdots \\ \vdots & & \ddots & \vdots & \ddots & \vdots \\ 1 & & & a_l & & b_m \end{pmatrix}$$

with the matrix

$$\begin{pmatrix} 0 & & & & b_0 & & \\ 0 & a_0 & & & \vdots & \ddots & \\ \vdots & \vdots & \ddots & & \vdots & & b_0 \\ 0 & a_l & & a_0 & b_m & & \vdots \\ \vdots & & \ddots & \vdots & & \ddots & \vdots \\ 1 & & & a_l & & & b_m \end{pmatrix}$$

Page 159, line 15: “of more” should be “or more”

Page 159, lines 15 and 16: “One way of doing this will be presented in §6, though readers” should be “Readers”

Page 159, last line of Exercise 1: “part b” should be “part (b)”

Page 159, lines 2 and 3 of Exercise 3: “x_i^i” should be “x_1^i” in two places

Page 160, line 8 of Exercise 6: “$f_1, \ldots, f_1$” should be “$f_1, \ldots, f_l$”

Page 160, line 1 of Exercise 12: “$\mathrm{Res}(x,g,x)$” should be “$\mathrm{Res}(f,g,x)$”

Page 161, line 4: “part a” should be “part (a)”

Page 161, line 6: “part b” should be “part (b)”

Page 161, line 12: "$= b_0'$" should be "$= b_0^l$"

Page 161, line -4: "part b" should be "part (b)"

Page 162, first line of display (1): "$a_0 x_1'$" should be "$a_0 x_1^l$"

Page 163, lowest entry in the first column of the large matrix: "a_1" should be "a_l"

Page 163, on same line as the large matrix: the period should be a comma

Page 163, line -6: "$k[x_2,\ldots,x_n][x_1]$" should be "$k(x_2,\ldots,x_n)[x_1]$"

Page 164, line 1: "$Res\ (f,g,x)$" should be "$\mathrm{Res}(f,g,x)$" ("Res" is in roman font with no space after it)

Page 165, line 3 of **Theorem 4**: "x_1^{Ni}" should be "$x_1^{N_i}$"

Page 165, line -16: "f_i and f" should be "f_i and f"

Page 165, lines -12 and -15: "$g_0(\mathbf{c})^{\deg(f)}$" should be "$g_i(\mathbf{c})^{\deg(f)}$" in two places

Page 165, line -8: "doesnot" should be "does not"

Page 166, line 2 of part (a) of Exercise 4: "$y - \gamma$" should be "$y = \gamma$"

Page 166, line 1 of part (b) of Exercise 4: "Theorem 3" should be "Proposition 3"

Page 167, line 2 of part (b) of Exercise 8: "$x^2 - 4$" should be "$6x^2 - 4$"

Page 167, line 1 of Exercise 9: "$h = \mathrm{Res}(f,g,x)[y]$" should be "$h = \mathrm{Res}(f,g,x) \in \mathbb{C}[y]$"

Page 167, last line of display at bottom of page: "coluumns" should be "columns"

Page 168, first display: "$g(x_i,\mathbf{c})$" should be "$g(x_1,\mathbf{c})$"

Page 178, line 3 of **Proposition 8**: "*1 belongs*" should be "1 *belongs*"

Page 181, equation (1): "$f_1^{a_1-1} f_2^{a_2-1} \ldots f_r^{a_r-1}$" with "$f_1^{a_1-1} f_2^{a_2-1} \cdots f_r^{a_r-1}$"

Page 181, display following equation (1): The quantity inside the large parentheses should be

$$a_1 \frac{\partial f_1}{\partial x_j} f_2 \cdots f_r + \cdots + a_r f_2 \cdots f_{r-1} \frac{\partial f_r}{\partial x_j}$$

Page 181, bottom display: "$\dfrac{\partial f_1}{\partial x_j}$" should be "$\dfrac{\partial f_i}{\partial x_j}$"

Page 183, line -7: "$I \cdot h \in$" should be "$l \cdot h \in$"

Page 184, line 2 of **Corollary 3**: "$\langle f_1 \rangle + \cdots \langle f_r \rangle$" should be "$\langle f_1 \rangle + \cdots + \langle f_r \rangle$"

Page 184, line 7: "$I+J=(x^2+y,z)$" should be "$I+J=\langle x^2+y,z\rangle$"

Page 185, line -13: "$\langle g_1,\dots,f_r\rangle$" should be "$\langle g_1,\dots,g_s\rangle$"

Page 186, line 1 of **Proposition 9**: "If and J" should be "If I and J"

Page 187, line 3 of **Lemma 10**: "$pr(x)$" should be "$p_r(x)$"

Page 188, line -10: "$k[t,x,y]$" should be "$\mathbb{Q}[t,x,y]$"

Page 188, line -8: "(Groebner basis of $(tI+(1-t)J$" should be "Groebner basis of $tI+(1-t)J$" (two errors)

Page 189, equation (1): "$g_{l+1}^{b_{l+1}}\cdot g_s^{b_s}$" should be "$g_{l+1}^{b_{l+1}}\cdots g_s^{b_s}$"

Page 190, line 2 of the proof of **Proposition 14**: Add a period at the end of the sentence.

Page 191, line 8: "$= f^m f^p$" should be "$= f^m f^p \in I\cap J$"

Page 191, part (b) of Exercise 6: This line should read "$(I_1\cdots I_r)^m = I_1^m\cdots I_r^m$"

Page 192, part (d) of Exercise 14: "$J\supset K$" should be "$J\supset K$ and α_A is onto"

Page 192, part (e) of Exercise 14: "$I\supset K$" should be "if $I\supset K$ and α_A is onto"

Page 193, line 1 of **Proposition 1**: "$\mathbf{V}(\mathbf{I}(S)$" should be "$\mathbf{V}(\mathbf{I}(S))$"

Page 193, line 2 of **Proposition 1**: "$\subset W]$." should be "$\subset W$*]*."

Page 194, line 6: "(xz,yz)" should be "$\langle xz,yz\rangle$"

Page 196, line -1: "$I\cap(g)$" should be "$I\cap\langle g\rangle$"

Page 197, part (b) of Exercise 7: "$\alpha^{-1}(I'):\alpha^{-1}(J')$" should be "$\alpha^{-1}(I'):\alpha^{-1}(J')$ when α_A is onto"

Page 200, line 4: "$f_1(f_1,\dots,t_m)$" should be "$f_1(t_1,\dots,t_m)$"

Page 201, line 16: "$f_i(x_1,\dots,x_n)$" should be "$f_i(t_1,\dots,t_m)$"

Page 207, line 7: "$V_1'\cup\cdots\cup V_m$" should be "$V_1'\cup\cdots\cup V_l'$"

Page 208, line -10: "equation (I)" should be "equation (1)"

Page 210, two lines before **Definition 1**: "$\langle x,y)$" should be "$\langle x,y\rangle$"

Page 211, line 2 of **Definition 5**: "$\cap_{i=1}^r$" should be "$\bigcap_{i=1}^r$"

Page 211, line 3 of **Definition 5**: "$\cap_{j\neq i}$" should be "$\bigcap_{j\neq i}$"

Page 211, line -12: "$\cap_{i=1}^{r}$" should be "$\bigcap_{i=1}^{r}$"

Page 211, line -5: "$\cap_{j\neq i}$" should be "$\bigcap_{j\neq i}$"

Page 212, line 1 of **Lemma 8**: "If is primary" should be "If I is primary"

Page 213, line 2 of part (c) of Exercise 3: "$\bigcap$" should be "$\cap$" in two places

Page 214, fourth item from bottom in right column: "$\overline{\pi_i(\mathbf{V}(I))}$" should be "$\overline{\pi_l(\mathbf{V}(I))}$"

Page 224, line 2 of second display: "by(1)" should be "by (1)"

Page 226, line 3: "$[y]^4 = [y]^4 = [0]$" should be "$[y]^4 = [y^4] = [0]$"

Page 226, line -12: "$[J] \in k[x_1,\ldots,x_n]/I$" should be "$[j] \in k[x_1,\ldots,x_n]/I$"

Page 226, line -9: "if $[J] \in J/I$" should be "if $[j] \in J/I$"

Page 234, parts (ii) and (iii) of **Theorem 6**: "x_i^{mi}" should be "$x_i^{m_i}$" (two errors)

Page 234, part (iv) of **Theorem 6**: "$\mathrm{span}(x^\alpha \cdot x^\alpha \notin \langle \mathrm{LT}(I)\rangle)$" should be "$\mathrm{span}(x^\alpha : x^\alpha \notin \langle \mathrm{LT}(I)\rangle)$"

Page 234, lines $-18, -17$ and -14: "x_i^{mi}" should be "$x_i^{m_i}$" (three errors)

Page 234, line -7: "$j-0,1,2,\ldots.$" should be "$j=0,1,2,\ldots.$" (two errors, one involving spacing of dots)

Page 234, line -6: "$\mathbb{C}[x_1,\ldots,x_n]/I$ That" should be "$\mathbb{C}[x_1,\ldots,x_n]/I$. That"

Page 236, line 5: "$g_i(p_i) = 1$" should be "$g_i(p_1) = 1$"

Page 236, line 6: "$g_i(p_1) = 0$" should be " $g_i(p_i) = 0$"

Page 236, line 6: "$f - g_2 \cdot g_3 \cdots g_m$" should be "$f = g_2 \cdot g_3 \cdots g_m$"

Page 236, line 9: "$f_i(p_i) = 0$" should be "$f_i(p_j) = 0$"

Page 236, line 15: "$\sum_{i=1}^m = a_i[f_i]$" should be "$\sum_{i=1}^m a_i[f_i]$"

Page 239, line 2 of part (i) of **Definition 2**: Add a period at the end of the display

Page 239, line 3 of part (i) of **Definition 2**: "$V_V(J)$" should be "$\mathbf{V}_V(J)$"

Page 239, line -7: "$J = \langle [x] \rangle \in \mathbb{R}[V]$" should be "$J = \langle [x] \rangle \subset \mathbb{R}[V]$"

Page 240, line 2 of **Proposition 4**: "$[f] \subset J$" should be "$[f] \in J$"

Page 244, line -9: "b_e" should be "b_i"

Page 247, lines 1 and 8 of Exercise 7: "$\phi(C)$" should be "$\pi(C)$" in two places

Page 247, line 1 of Exercise 10: “isomorphism” should be “homomorphism”

Page 249, line -16: “Similarly, we use $k[x_1,\ldots,x_n]$” should be “Similarly, we use $k(x_1,\ldots,x_n)$”

Page 249, line -15: “$k[V]$ for the function field” should be “$k(V)$ for the function field”

Page 249, line -14: “function field $k[V]$” should be “function field $k(V)$”

Page 249, line -7: “$k(V)$” should be “$k[V]$”

Page 250, line -1: “$a(x^2/y^2)$” should be “$a(x^2/y^4)$”

Page 251, line 1: “$x^2/y^4 - y$” should be “$x^2/y^4 = y$”

Page 251, line 9: “$\{P\}$” should be “$\{p\}$”

Page 251, line -11: “$\mathbb{R}(Q$” should be “$\mathbb{R}(Q)$”

Page 252, display (5): “$f_1(x_2,\ldots,x_m)$” should be “$f_1(x_1,\ldots,x_m)$”

Page 253, line 8: “$f_ik_i - h_ig_i, \in \mathbf{I}(V)$” should be “$f_ik_i - h_ig_i \in \mathbf{I}(V)$”

Page 253, line 14: “$f_ik_i - h_ig_i, \mathbf{I}(V)$” should be “$f_ik_i - h_ig_i \in \mathbf{I}(V)$”

Page 255, line -17: “$V - \mathbf{V}(y^5 - x^2)$” should be “$V = \mathbf{V}(y^5 - x^2)$”

Page 257, line 1 of Exercise 9: Insert a space between the period and “If”

Page 258, lines -13 and -10: “k^{n-1}” should be “k^{n-l}” in two places

Page 259, line 16: “$f(a_1,\ldots,a_n,)$” should be “$f(a_1,\ldots,a_n)$”

Page 260, display (5): “$+\cdots v_{j,r-1}x_1^{r-1}$” should be “$+\cdots+v_{j,r-1}x_1^{r-1}$”

Page 260, line following display (5): “$0 \le j \le r$” should be “$0 \le j \le r.$” (add period)

Page 261, lines 8 and 9: “$v_t f^{j-t}$” should be “$v_j f^{j-t}$” (two errors)

Page 261, line 10: “v_i” should be “v_t”

Page 261, line 15: “$v_0(c^2,\ldots,c_n)$” should be “$v_0(c_2,\ldots,c_n)$”

Page 261, line 18: “$u_rv_0 \in I_1$” should be “$u_rv_0 \notin I_1$”

Page 261, line 20: “$I = (h, f_1,\ldots,f_s)$” should be “$I = \langle h, f_1,\ldots,f_s\rangle$”

Page 261, line 22: “$v_0(c_2,\ldots,c_n \neq 0$” should be “$v_0(c_2,\ldots,c_n) \neq 0$”

Page 261, line -2: “$\mathbf{V}(I_1)$” should be “$\mathbf{V}(I_l)$”

Page 262, line 2: "$\tilde{\pi}_{l-l}$" should be "$\tilde{\pi}_{l-1}$'

Page 262, line –2: "k^{n-1}" should be "k^{n-l}"

Page 262, line –1: "$\pi_1(V)$" should be "$\pi_l(V)$"

Page 263, line 1: "$\mathbf{V}(I_l)$ By" should be "$\mathbf{V}(I_l)$. By"

Page 263, line 4: "K^n" should be "k^n"

Page 263, line 6: "Z^1" should be "Z_1"

Page 263, line 2 of Exercise 2: "$\sum_{i=o}^{r} u_i(x_2,\ldots,x_n,x_1^i$" should be "$\sum_{i=0}^{r} u_i(x_2,\ldots,x_n)x_1^i$" (two errors)

Page 264, line 2 of Exercise 7: "$(a_l+_1,\ldots,a_n)$" should be "$(a_{l+1},\ldots,a_n)$"

Page 264, line 3 of Exercise 7: "$\subset$" should be "$\cup$"

Page 268, line -4: "$f(i)=c$" should be "$f(j)=c$"

Page 276, line following display (7): "$\mathbf{V}\times$" should be "$V\times$"

Page 296, line 2 of display (7): "$(\mathrm{O}-x_8)^2$" should be "$(0-x_8)^2$"

Page 299, line 11: "$V',U_1,U_2,U_3,$ are the" should be "V',U_1,U_2,U_3 are the"

Page 299, line 12: "$U_1,U_2,U_3,\subset V$" should be "$U_1,U_2,U_3\subset V$"

Page 300, line 2: "$\mathbb{R}[u_1,\ldots u_m]$" should be "$\mathbb{R}[u_1,\ldots,u_m]$"

Page 300, line 6: "where the u_i, *are*" should be "where $u_1,\ldots,u_m$ *are*" (two errors)

Page 307, display (1) at bottom of page: "$\ldots$" should be "$\cdots$" in two places

Page 310, line 8 of *Step 1*: "beginning with X_n" should be "beginning with x_n"

Page 310, line 9 of *Step 1*: "variable x_n, Call the" should be "variable x_n. Call the"

Page 311, line 4: "in S unchanged" should be "in S unchanged"

Page 311, line 6 of last display: "$h_6=x_1x_5-u_2x_6$" should be "$h_6=u_1x_5-u_2x_6$"

Page 312, line 5 of **Theorem 4**: "$x_i,\ldots,x_{j-1}$" should be "$x_1,\ldots,x_{j-1}$"

Page 314, last display: "$d_8=-2x_4\neq 0$" should be "$d_8=2x_4\neq 0$"

Page 314, 4 lines below last display: "condition $-2x_4\neq 0$" should be "condition $2x_4\neq 0$"

Page 315, line 3 of Exercise 1: "d_m^l" should be "d_m^s"

Page 323, line 12: “α_i” should be “σ_i”

Page 324, line 2 of Exercise 5: “$k[x,y,z,]$” should be “$k[x,y,z]$”

Page 326, line 3: “$\sum_{i=1}^{k}(-1)^i h_{k-i}(x_k,\ldots,x_n)\sigma_i(z_1,\ldots,x_n)$” should be “$\sum_{i=0}^{k}(-1)^i h_{k-i}(x_k,\ldots,x_n)\sigma_i(x_1,\ldots,x_n)$” (two errors)

Page 326, line 12 (last line of part (b) of Exercise 11): “ $\sum_{1=|S|}^{k}$ ” should be “ $\sum_{i=|S|}^{k}$ ”

Page 326, line -18 (last line of part (c) of Exercise 12): “$g_1,\ldots,g_k$” should be “$g_1,\ldots,g_n$”

Page 327, line -4: “GL (n,k)” should be “GL(n,k)” (no space after “GL”)

Page 327, line -1: “GL (n,k)” should be “GL(n,k)” (no space after “GL”)

Page 329, display (1): “$a_{nn}z_n$” should be “$a_{nn}x_n$” at the end of line

Page 330, line -5: “$k[\sigma_1\ldots,\sigma_n]$” should be “$k[\sigma_1,\ldots,\sigma_n]$”

Page 332, line 2: “$(B_1\cdots B_1)$” should be “$(B_1\cdots B_t)$”

Page 332, line 3: “B_1” should be “B_t”

Page 332, first line of fifth display: “$\sum_{ij}(-x)^i y^j$” should be “$\sum_{ij} a_{ij}(-x)^i y^j$”

Page 333, fourth display: “$z^2\cdot(xy)^2$” should be “$x^2\cdot(xy)^2$”

Page 333, line -2: “$[I_n,A,A^2,\ldots,A^{m-1}]$” should be “$\{I_n,A,A^2,\ldots,A^{m-1}\}$”

Page 339, line -9: “$F\left(\sum_{|\beta|=1} b_\beta R_G(X^\beta)u^\beta,\ldots,\sum_{|\beta|=|G|} R_G(X^\beta)u^\beta\right)$” should be “$F\left(\sum_{|\beta|=1} b_\beta R_G(x^\beta)u^\beta,\ldots,\sum_{|\beta|=|G|} R_G(x^\beta)u^\beta\right)$” (two errors)

Page 340, third display: “$k[x,y)^{C_4}$” should be “$k[x,y]^{C_4}$”

Page 341, line 7: “$k[f_1,\ldots,x_m]$” should be “$k[f_1,\ldots,f_m]$”

Page 341, line 2 of the proof of **Proposition 7**: “$\{g_1,\ldots,g_1\}$” should be “$\{g_1,\ldots,g_t\}$”

Page 343, line 1 of Exercise 3: “$C_4,\subset$” should be “$C_4\subset$”

Page 343, line 5 of Exercise 3: "$R_{C4}(x^i y^j)$" should be "$R_{C_4}(x^i y^j)$"

Page 343, line 14 of Exercise 5: "$f = \sum_{i=1}^m R_G(h_i)$" should be "$f = \sum_{i=1}^m R_G(h_i) f_i$"

Page 343, line 2 of Exercise 6: "$k(x_1, \ldots, x_n)^H$" should be "$k[x_1, \ldots, x_n]^H$"

Page 344, line 1 of Exercise 8: "Let A be" should be "Let A be"

Page 344, line 1 of Exercise 9: "Let A be" should be "Let A be"

Page 344, line 3 of Exercise 9: "that A generates" should be "that A generates"

Page 344, line 7 of Exercise 9: "$k[x,y]^{c8}$" should be "$k[x,y]^{C_8}$" (two errors)

Page 344, line 2 of Exercise 11: "$k[x,y]^{C4}$" should be "$k[x,y]^{C_4}$"

Page 345, line -1: "f_g" should be "fg"

Page 346, line 8: "$I_F = (uv - w^2)$" should be "$I_F = \langle uv - w^2 \rangle$"

Page 346, line 1 of **Proposition 2**: "if $k[x_1, \ldots, z_n]^G$" should be "If $k[x_1, \ldots, x_n]^G$" (two errors)

Page 347, line 2 of **Proposition 3**: "$\langle f_1, \ldots, y_1, \ldots, f_m - y_m \rangle$" should be "$\langle f_1 - y_1, \ldots, f_m - y_m \rangle$"

Page 347, display (2): "$k[z_1, \ldots, x_n]$" should be "$k[x_1, \ldots, x_n]$"

Page 347, last display: "$k[z_1, \ldots, z_n]$" should be "$k[x_1, \ldots, x_n]$" (two errors)

Page 348, first line of first display: "$u = x_2$," should be "$u = x^2$,"

Page 349, first display: "$k[z_1, \ldots, x_n]^G$" should be "$k[x_1, \ldots, x_n]^G$"

Page 350, display (3): "$k(y_1, \ldots, y_m)/I_F$" should be "$k[y_1, \ldots, y_m]/I_F$" and "$[x_1, \ldots, x_n]^G$" should be "$k[x_1, \ldots, x_n]^G$" (two errors)

Page 352, line 3 of **Lemma 11**: "$f^N + g_1 f^{N-1} + \cdots + g_N + 0$" should be "$f^N + g_1 f^{N-1} + \cdots + g_N = 0$"

Page 367, line -15: "part(a)" should be "part (a)"

Page 369, line 12: "$(x_1, \ldots, x_0)$" should be "$(x_1, \ldots, x_n)$"

Page 370, line 1 of **Proposition 4**: "$k[x_0, \ldots, x_1]$" should be "$k[x_0, \ldots, x_n]$"

Page 372, line 2: "$V(g_1, \ldots, g_s)$" should be "$\mathbf{V}(g_1, \ldots, g_s)$"

Page 376, line 4 of Exercise 9: "f" should be "f_j"

Page 379, line 12: "I will contain" should be "I will contain"

Page 381, line 4 of **Theorem 6**: "$= \ldots.$" should be "$= \cdots.$"

Page 381, last line of **Theorem 6**: Remove the extra space between "V_j" and "for".

Page 382, line 6: "$f^n \in I$ for some $n \geq 1$" should be "$f^m \in I$ for some $m \geq 1$" (two errors)

Page 382, line -10: "**V.**" should be "**V**." (the period should not be bold)

Page 387, line 6: "**V.**" should be "**V**." (the period should not be bold)

Page 388, third display: Reduce the amount of space on either side of "and". Thus the display should appear as follows:

$$x^\alpha x_0^d >_h x^\beta x_0^e \iff x^\alpha > x^\beta \quad \text{or} \quad x^\alpha = x^\beta \text{ and } d > e.$$

Page 398, line 3 of **Theorem 6**: "$I = (F_1, \ldots, F_s)$" should be "$I = \langle F_1, \ldots, F_s \rangle$"

Page 398, line -3: "$F_1(x_0, \ldots, x_n, \mathbf{c})$" should be "$F_i(x_0, \ldots, x_n, \mathbf{c})$"

Page 399, line 3: "$i = 0, \ldots, s$" should be "$i = 1, \ldots, s$"

Page 400, two lines before **Proposition 7**: "climination" should be "elimination"

Page 400, line 2 of proof of **Proposition 7**: "$\langle x_0^r, \ldots, x_n^e \rangle$" should be "$\langle x_0^e, \ldots, x_n^e \rangle$"

Page 402, line 4: "$f =$" should be "$F =$"

Page 403, line 9: "$V = \mathbf{V}_a(\mathbf{I})$" should be "$V = \mathbf{V}_a(I)$"

Page 404, line -17: "$\ldots f_m(x_0, \ldots, x_n))$" should be "$\ldots, f_m(x_0, \ldots, x_n))$"

Page 405, second display: "$\displaystyle\sum_{|\alpha = k, |\beta| = l}$" should be "$\displaystyle\sum_{|\alpha| = k, |\beta| = l}$"

Page 407, line 3 of Exercise 11: "$k[x_0, \ldots \hat{x}_i, \ldots, x_n, y_1, \ldots, y_m]$" should be "$k[x_0, \ldots, \hat{x}_i, \ldots, x_n, y_1, \ldots, y_m]$"

Page 411, line 4: "to z to" should be "to z to"

Page 411, line 2 of the proof of **Theorem 4**: "f has" should be "f has"

Page 411, line -9: "X_2^2" should be "X_0^2"

Page 411, line -3: "$x_j x_j$" should be "$x_i x_j$"

Page 413, line 6: "$\mathbf{X}$" should be "$\mathbf{x}$"

Page 413, line 9: "$\mathbf{x}'$" should be "$\mathbf{x}^t$"

Page 416, line 15: "$\mathbf{V}(z_0 z_3 - z_1 z_3)$" should be "$\mathbf{V}(z_0 z_3 - z_1 z_2)$"

Page 416, line 18: "$(b_0,b_1,0,0,)$" should be "$(b_0,b_1,0,0)$"

Page 417, line -3: "$sq-tq$" should be "$sp-tq$"

Page 420, line 2 of Exercise 6: "$\mathbf{x}^tQ(\mathbf{x})$" should be "$\mathbf{x}^tQ\mathbf{x}$"

Page 420, line 7 of Exercise 9: "part a" should be "part (a)"

Page 421, line 4 of Exercise 14: "is a line" should be "is either empty or a line"

Page 421, line 2 of Exercise 19: "$\mathbf{V}(z_0z_{23}-z_{02}z_{13}+z_{03}z_{12})$" should be "$\mathbf{V}(z_{01}z_{23}-z_{02}z_{13}+z_{03}z_{12})$"

Page 425, line 4: "f_i, is" should be "f_i is"

Page 428, lines 7 and 8: "Lemma 6" should be "Lemmas 5 and 6"

Page 431, lines -15 and -10: "$\bigcup\limits_{p\neq q\ in\ C\cap D}$" should be "$\bigcup\limits_{p\neq q \text{ in } C\cap D}$"

Page 431, line -12: "$\bigcup\limits_{p\neq q\ in\ c\cap D}$" should be "$\bigcup\limits_{p\neq q \text{ in } C\cap D}$"

Page 432, line 3: "$(v_{1,B}x-u_{1,B}y)^{m_i,B}\cdots(v_{s,B}x-u_{s,B}y)^{m_s,B}$" should be "$(v_{1,B}x-u_{1,B}y)^{m_{1,B}}\cdots(v_{s,B}x-u_{s,B}y)^{m_{s,B}}$" (three errors: in the two exponents, B should be the second subscript of m, and in the first exponent, the first subscript should be 1)

Page 432, line 4: "$C_B\neq 0$" should be "$c_B\neq 0$"

Page 432, line 13: "$(u_{i,B0},v_{i,B0})$" should be "(u_{i,B_0},v_{i,B_0})"

Page 440, line 10: "$x_1,\ldots x_n$" should be "$x_1,\ldots,x_n$" (add a comma)

Page 440, line 4 of the proof of **Proposition 1**: "H_{xk}" should be "H_{x_k}"

Page 442, line 12: "its radical $\sqrt{1}$" should be "its radical $\sqrt{I}$"

Page 448, line -15: "I_{jo}" should be "I_{j_0}"

Page 448, lines -14 and -13: "j_o" should be "j_0" (two errors)

Page 449, line 1 of **Theorem 6**: "$dim\ \mathbf{V}(I)$" should be "$\dim \mathbf{V}(I)$"

Page 450, line 3: "$\cup\ldots\cup$" should be "$\cup\cdots\cup$"

Page 451, third display: "5_S-5" should be "$5s-5$"

Page 453, line 1 of part (a) of Exercise 1: "the 1" should be "the l"

Page 458, line -3: Insert a period after "$f_1,\dots,f_m$"

Page 459, line 5: Insert a period after "$\langle \mathrm{LT}(I)\rangle_{\leq s}$"

Page 459, line 7: "$[\mathrm{LM}(f_1,$" should be "$[\mathrm{LM}(f_1),$" (insert right parenthesis)

Page 463, display (6): "$\mathrm{LM}(f)$has total" should be "$\mathrm{LM}(f)$ has total" (insert space)

Page 466, line 3 of Exercise 2: "$[v_{m+n}],\dots,[v_{m+1}]$" should be "$[v_{m+1}],\dots,[v_{m+n}]$"

Page 467, line 2 of Exercise 15: "$\langle x_1,\dots x_n\rangle^r$" should be "$\langle x_1,\dots,x_n\rangle^r$"

Page 469, line -6: "$\pi[g])$" should be "$\pi([g])$" (insert left parenthesis)

Page 470, lines 7 and 11: "$\leq$" should be "$\geq$" (two errors)

Page 470, line 18: "$\dim \mathbf{V}(I)-1$by" should be "$\dim \mathbf{V}(I)-1$ by" (insert space)

Page 483, line 1 of Exercise 12: "see Chapters" should be "see Chapter"

Page 488, line 7: "$(f_1\cdots f_r)$" should be "$\mathbf{V}(f_1\cdots f_r)$"

Page 488, last display: "$2y^2z+3z^2$" should be "$-2y^2z+3z^2$"

Page 491, line 5: "T_p" should be "$T_p(V)$"

Page 495, line 5: "of f to" should be "of f to"

Page 498, line 2: "$\langle (g_1),$" should be "$\langle (g_1)_{min},$"

Page 498, line -10: "some m" should be "some m"

Page 499, line -1: "$\lim_{k\to\infty} v_k = v\ in\ \mathbb{C}^n$" should be "$\lim_{k\to\infty} v_k = v$ *in* $\mathbb{C}^n$" (the "in" needs to be in italic text mode, not math mode)

Page 500, line -4: "$t_k^i f(v_k)$" should be "$t_k^i f_i(v_k)$"

Page 501, line 13 (third display): Add a period at the end

Page 501, first summation in the fifth display: "$\sum_{i.j}$" should be "$\sum_{i,j}$"

Page 501, second summation of the fifth display: "$\sum_{i\cdot j}\lambda^j g_{ij}(v)\lambda^{-1}t^i$" should be "$\sum_{i,j}\lambda^j g_{ij}(v)\lambda^{-i}t^i$"

Page 501, third summation in the fifth display: "$\sum_{ij}$" should be "$\sum_{i,j}$"

Page 501, line -1: "$f(v,t)$" should be "$\tilde{f}(v,t)$"

Page 502, line -15: "$q_k \neq V$" should be "$q_k \in V$"

Page 502, line -1: "$\mathscr{V}$" should be "$\overline{\mathscr{V}}$" (overline over the calligraphic V)

Page 503, last line of the proof of **Corollary 9**: Add a period

Page 503, line 3 of proof of **Theorem 8**: "$\mathbf{V}(f_{p.min)}$" should be "$\mathbf{V}(f_{p,min})$" (two errors)

Page 504, line 4 of Exercise 1: "$\dfrac{\partial^\alpha}{\partial^\alpha x} = \dfrac{\partial^{\alpha_1}}{\partial^{\alpha_1} x_1} \cdots \dfrac{\partial^{\alpha_n}}{\partial^{\alpha_n} x_n}$" should be "$\dfrac{\partial^\alpha}{\partial x^\alpha} = \dfrac{\partial^{\alpha_1}}{\partial x_1^{\alpha_1}} \cdots \dfrac{\partial^{\alpha_n}}{\partial x_n^{\alpha_n}}$"

Page 504, line 6 of Exercise 1: "$\alpha_1! \cdot \alpha_2! \cdot \alpha_n!$" should be "$\alpha_1! \cdot \alpha_2! \cdots \alpha_n!$"

Page 504, line 8 of Exercise 1: "$\dfrac{\partial^\alpha (x-p)^\beta}{\partial^\alpha x}(p)$" should be "$\dfrac{\partial^\alpha (x-p)^\beta}{\partial x^\alpha}(p)$"

Page 504, lines 12 and 14 of Exercise 1: "$\dfrac{\partial^\alpha f}{\partial^\alpha x}(p)$" should be "$\dfrac{\partial^\alpha f}{\partial x^\alpha}(p)$" in two places

Page 545, index entry for "ideal, in a ring": "228" should be "226"

Page 547, index entry for mapping, rational: "251" should be "251–52"