Errata

- p 28, exercise 2: change $s_1, \ldots, s_k$ to $s_1 = (1, \sigma), \ldots, s_k$
- p 28, exercise 3: change $n \geq 0$ to $n > 0$
- p 32, exercise 7: change last sentence to:

  > Show that the functions computed by straightline programs [see Exercise 6] are a proper subset of the functions computed by forward-branching programs.

- p 43, l -5: change h_2, h_2, h_3 to h_1, h_2, h_3
- p 61, l -3: change $(x)j$ to $(x)_j$
- p 62, exercise 1: append to first sentence: "and $f'(x)\uparrow$ if $\mathrm{Lt}(x) > n$"
- p 62, exercise 2: change first sentence to:

  > Define $\mathrm{Sort}([x_1, \ldots, x_n] - 1) = [y_1, \ldots, y_n] - 1$, where $n = \mathrm{Lt}([x_1, \ldots, x_n])$ and $y_1, \ldots, y_n$ is a permutation of $x_1, \ldots, x_n$ such that $y_1 \leq \cdots \leq y_n$.

- p 71, l -12: change Im to I_m
- p 76, l 9: change "this equation" to "equation (3.1)"
- p 79, l 13: change "$\mathrm{Lt}(x) = m$" to "$\mathrm{Lt}(x) \leq m$ & $x > 0$"
- p 86, l -9: insert "$\cdot$" between product terms
- p 95, ll 3 and 9: change TOTAL to TOT
- p 97, exercise 8: append to first sentence: "such that $\emptyset \subset R_\Gamma \subset N$"
- p 111: change the definition of $\phi_t(x)$ to:

$$\phi_t(x) = \begin{cases} x+1 & \text{if } t = 0 \\ 0 & \text{if } t = 1 \\ l(x) & \text{if } t = 2 \\ r(x) & \text{if } t = 3 \\ \phi_{l(n)}(\phi_{r(n)}(x)) & \text{if } t = 3n+4,\ n \geq 0 \\ \langle \phi_{l(n)}(x), \phi_{r(n)}(x) \rangle & \text{if } t = 3n+5,\ n \geq 0 \\ 0 & \text{if } t = 3n+6,\ n \geq 0 \text{ and } x = 0 \\ \phi_{l(n)}((x-1)/2) & \text{if } t = 3n+6,\ n \geq 0 \text{ and } x \text{ is odd} \\ \phi_{r(n)}(\phi_t(x/2)) & \text{if } t = 3n+6,\ n \geq 0 \text{ and } x \text{ is even} \end{cases}$$

- p 111, second line after definition of $\phi_t(x)$: change "where $n > 0$ and $i = 1$, 2, or 3" to "where $n \geq 0$ and $i = 4$, 5, or 6"
- p 111: change the definition of $g(z,t,x)$ to:

$$g(z,t,x) = \begin{cases} x+1 & \text{if } t = 0 \\ 0 & \text{if } t = 1 \\ l(x) & \text{if } t = 2 \\ r(x) & \text{if } t = 3 \\ \Phi_z^{(2)}(l(n), \Phi_z^{(2)}(r(n), x)) & \text{if } t = 3n+4,\ n \geq 0 \\ \langle \Phi_z^{(2)}(l(n), x), \Phi_z^{(2)}(r(n), x) \rangle & \text{if } t = 3n+5,\ n \geq 0 \\ 0 & \text{if } t = 3n+6,\ n \geq 0 \text{ and } x = 0 \\ \Phi_z^{(2)}(l(n), \lfloor x/2 \rfloor) & \text{if } t = 3n+6,\ n \geq 0 \text{ and } x \text{ is odd} \\ \Phi_z^{(2)}(r(n), \Phi_z^{(2)}(t, \lfloor x/2 \rfloor)) & \text{if } t = 3n+6,\ n \geq 0 \text{ and } x \text{ is even} \end{cases}$$

- p 119, l -15: change 10 to 109
- p 121, exercise 8: change "Show" to "For $n \geq 2$, show"
- p 143: insert missing last line: "program in Fig. 4.5. You may use macros."
- p 155, l 2: change "represents" to "represent"
- p 165, l 8 of Table 6.1: change $\bar{q}_i$ to $\tilde{q}_i$
- p 171, exercise 4: add # to set A and change $b_{j_1}^{i_1} \cdots b_{j_n}^{i_n}$ to $\# b_{j_1}^{i_1} \cdots b_{j_n}^{i_n} \#$
- p 190, l -14: change $\overset{*}{\underset{\Pi}{\Rightarrow}}$ to $\overset{*}{\underset{\Gamma}{\Rightarrow}}$
- p 215, l 6: change "principle" to "principal"
- p 232, l 14: append to paragraph: "(E.g., $3 = \langle 2, 0 \rangle$ codes (0,0), (0,0).)"
- p 233, l 6: change "$a_i \in a_i \in$" to "$a_i \in$"
- p 253, l 2: change $u_1, \ldots, u_n$ to $u_1 \cdots u_n$
- p 255, l -11: append to line: "$R_{ii}^0 = \{0\}$, and, for $i \neq j$,"
- p 258, l 9: change "language" to "languages"
- p 258, l -1: change last $\cup$ to $\bigcup$
- p 298, l 12: change "us" to "use"
- p 309, l -13: change $T*$ to T^*

- p 310, l 15: change $T*$ to T^*
- p 310, l −5: change "$\{\mathbf{0})$" to "$\{\mathbf{0}\}$"
- p 320, exercise 8(**c**): change $L = N(\mathcal{M})$ to $L \cup \{0\} = N(\mathcal{M})$
- p 349, l 2 (after Table 1.1): delete $\times$
- p 387, l −14: change $\vee$ to $\boldsymbol{v}$
- p 407: change exercises 2 and 3 as follows:

  2. Let $\mathbf{W}$ be a vocabulary with relation symbol $\mathbf{=}$, where $\delta(\mathbf{=}) = 2$, and let Ω be a set of $\mathbf{W}$-sentences containing $\mathrm{EQ}_{\mathbf{W}}$, where $\mathrm{EQ}_{\mathbf{W}}$ consists of the sentence $(\forall \boldsymbol{x})(\boldsymbol{x}\mathbf{=}\boldsymbol{x})$ and all sentences of the form

  $$(\forall \boldsymbol{x}_1)\cdots(\forall \boldsymbol{x}_{2i})((\boldsymbol{x}_1\mathbf{=}\boldsymbol{x}_{i+1} \wedge \cdots \wedge \boldsymbol{x}_i\mathbf{=}\boldsymbol{x}_{2i}) \supset f(\boldsymbol{x}_1,\ldots,\boldsymbol{x}_i)\mathbf{=}(\boldsymbol{x}_{i+1},\cdots,\boldsymbol{x}_{2i})),$$
  $$(\forall \boldsymbol{x}_1)\cdots(\forall \boldsymbol{x}_{2j})((\boldsymbol{x}_1\mathbf{=}\boldsymbol{x}_{j+1} \wedge \cdots \wedge \boldsymbol{x}_j\mathbf{=}\boldsymbol{x}_{2j} \wedge p(\boldsymbol{x}_1,\ldots,\boldsymbol{x}_j)) \supset p(\boldsymbol{x}_{j+1},\cdots,\boldsymbol{x}_{2j}))$$

  where f is a function symbol in $\mathbf{W}$ with $\delta(f) = i$, and p is a predicate symbol in $\mathbf{W}$ with $\delta(p) = j$. A model I of Ω is *normal* if $\mathbf{=}^I(x, y) = 1$ if and only if x, y are the same element. Show that Ω has a model if and only if it has a normal model. [*Hint:* Let D be the domain of a model of Ω. Create a normal model using domain elements $[a] = \{x \in D \mid \mathbf{=}^I(x, a) = 1\}$, where $a \in D$.]

  3. Let $\mathbf{W}$ and δ be as in Exercise 2. Show that if Ω has arbitrarily large finite normal models, then it has an infinite normal model. [*Hint:* Show that $\Omega \cup \{(\exists \boldsymbol{x}_1)\cdots(\exists_n) \bigwedge_{1\le i<j\le n} \neg\boldsymbol{x}_i\mathbf{=}\boldsymbol{x}_j \mid n \in N\}$ has a normal model.]

- p 410, exercise 5: change introduction to

  Let $\mathbf{W}$ be a vocabulary with relation symbol $\mathbf{=}$, where $\delta(\mathbf{=}) = 2$. A function $f(x_1, \ldots, x_n)$ is *representable* in an axiomatizable theory $\mathbf{T}$ containing $\mathrm{EQ}_{\mathbf{W}}$ [see Exercise 6.2] if there is a formula $\alpha(b_1, \ldots, b_n, b)$ such that if $f(m_1, \ldots, m_n) = k$ then

  $$\vdash_{\mathbf{T}} \alpha(\overline{m_1}, \ldots, \overline{m_n}, \overline{k}) \quad \text{and} \quad \vdash_{\mathbf{T}} (\forall \boldsymbol{y})(\alpha(\overline{m_1}, \ldots, \overline{m_n}, \boldsymbol{y}) \supset \boldsymbol{y}\mathbf{=}\overline{k}).$$

  We say that α *represents* $f(x_1, \ldots, x_n)$ in $\mathbf{T}$. Let $\mathbf{T}$ be a consistent axiomatizable theory [see Exercise 2] such that (i) $\mathrm{EQ}_{\mathbf{W}} \subseteq \mathbf{T}$, (ii) $\vdash_{\mathbf{T}} \neg\overline{0}\mathbf{=}\overline{1}$, and (iii) every primitive recursive function is representable in $\mathbf{T}$.

- p 410, exercise 5(**d**): change $\vdash_{\mathbf{T}} \overline{0} \neq \overline{1}$ to $\vdash_{\mathbf{T}} \neg\overline{0}\mathbf{=}\overline{1}$.

- p 450, exercise 11 should be: Prove Theorem 2.3 without using Church's thesis.
- p 455, l -12: change $\rho_{i_e,j,k}$ to $\rho_{i_c,j,k}$ and change $\sigma_{j_e,j,k+1}$ to $\sigma_{j_c,j,k+1}$
- p 456, l 9: change "it" to "the preceding configuration"
- p 486, l 3: delete $\sqcup$
- p 493, l -17: change $(D \underset{s}{\rightarrow}$ to $(D \underset{s}{\rightarrow} E$
- p 507, l -16: delete second $\boldsymbol{)}$
- p 509, l -14: change $\rightarrow$ to $\boldsymbol{\rightarrow}$
- p 517, l 12: t should be $\boldsymbol{t}$
- p 520, l 11, l 12: change $\sqsubseteq_{\mathcal{A}_{\mathcal{T}(V)}}$ to $\sqsubseteq_{\mathcal{A}_{\mathcal{T}}(V)}$
- p 542, l 15: delete "a"
- p 549, l 11: change $\sqsubseteq_{\boldsymbol{\tau}_i^+}$ to $\sqsubseteq_{\boldsymbol{\tau}^+}$
- p 549, l 13: change $\sqsubseteq_{\boldsymbol{\tau}^+}$ to $\sqsubseteq_{\boldsymbol{\tau}_i^+}$
- p 552, l 3: change 1 to $\mathbf{1}$
- p 562, l -10: change $\mathbf{if}_{\mathbf{N}}(\cdots)$ to $\mathbf{if}_{\mathbf{N}}\boldsymbol{(}\cdots\boldsymbol{)}$
- p 563 l 11: $\underline{\mathbf{s}_{\mathbf{1}}^{\mathbf{-1}}}\mathbf{(1)}$ to $\underline{\mathbf{s}_{\mathbf{1}}^{\mathbf{-1}}\mathbf{(1)}}$
- p 564, l 4 of footnote: delete first ","
- p 565, l -6: delete last ")"
- p 565, l -4: change $\mathrm{rr}_{\mathbf{P}}\boldsymbol{(}\mathbf{is\_0(2)}\boldsymbol{)}$ to $\mathrm{rr}_{\mathbf{P}}(\mathbf{is\_0(2)})$
- p 570, l 10: change first "on" to "and"
- p 578, l -1: change X_n to $\mathbf{X}_n$, change X_1 to $\mathbf{X}_1$
- p 580, l 13: change $\Big[\cdots\Big]$ to $[\cdots]$
- p 597, column 2, l -15: change $\alpha_{(d_1\ldots d_n)}$ to $\alpha_{(d_1,\ldots,d_n)}$
- p 598, column 2, l 7: change $\mathbf{T}_{\mathcal{S}}$ to $\mathbf{T}_{\scriptscriptstyle\mathcal{S}}$