

Errata

- p 28, exercise 2: change s_1, \dots, s_k to $s_1 = (1, \sigma), \dots, s_k$
- 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 $\text{Lt}(x) > n$ ”
- p 62, exercise 2: change first sentence to:

Define $\text{Sort}([x_1, \dots, x_n] - 1) = [y_1, \dots, y_n] - 1$, where $n = \text{Lt}([x_1, \dots, x_n])$ and y_1, \dots, y_n is a permutation of x_1, \dots, x_n such that $y_1 \leq \dots \leq y_n$.
- 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 “ $\text{Lt}(x) = m$ ” to “ $\text{Lt}(x) \leq m \ \& \ x > 0$ ”
- p 86, l 9: insert “.” between product terms
- p 95, ll 3 and 9: change TOTAL to TOT
- p 97, exercise 8: append to first sentence: “such that $\mathcal{Q} \subset R_\Gamma \subset N$ ”
- 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 1–15: 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 1–14: change $\xrightarrow[\Pi]{*}$ to $\xrightarrow[\Gamma]{*}$
- 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, \dots, u_n to $u_1 \cdots u_n$
- p 255, l 1–11: append to line: “ $R_{ii}^0 = \{0\}$, and, for $i \neq j$,”
- p 258, l 9: change “language” to “languages”
- p 258, l 1–1: change last \cup to \mathbf{U}
- p 298, l 12: change “us” to “use”
- p 309, l 1–13: change T^* to T^*

- p 310, l 15: change T^* to T^*
- p 310, l –5: change “ $\{0\}$ ” to “ $\{0\}$ ”
- 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 \mathbf{V} to \mathbf{v}
- p 407: change exercises 2 and 3 as follows:

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

$$\begin{aligned} & (\forall \mathbf{x}_1) \cdots (\forall \mathbf{x}_{2i}) ((\mathbf{x}_1 = \mathbf{x}_{i+1} \wedge \cdots \wedge \mathbf{x}_i = \mathbf{x}_{2i}) \supset f(\mathbf{x}_1, \dots, \mathbf{x}_i) = (\mathbf{x}_{i+1}, \dots, \mathbf{x}_{2i})), \\ & (\forall \mathbf{x}_1) \cdots (\forall \mathbf{x}_{2j}) ((\mathbf{x}_1 = \mathbf{x}_{j+1} \wedge \cdots \wedge \mathbf{x}_j = \mathbf{x}_{2j} \wedge p(\mathbf{x}_1, \dots, \mathbf{x}_j)) \supset p(\mathbf{x}_{j+1}, \dots, \mathbf{x}_{2j})) \end{aligned}$$

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 $\equiv^I(x, y) = 1$ 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 $[a] = \{x \in D \mid \equiv^I(x, a) = 1\}$, 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 $\Omega \cup \{(\exists \mathbf{x}_1) \cdots (\exists \mathbf{x}_n) \bigwedge_{1 \leq i < j \leq n} \neg \mathbf{x}_i = \mathbf{x}_j \mid n \in \mathbb{N}\}$ has a normal model.]

- p 410, exercise 5: change introduction to

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

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

We say that α *represents* $f(x_1, \dots, x_n)$ in \mathbf{T} . Let \mathbf{T} be a consistent axiomatizable theory [see Exercise 2] such that (i) $\text{EQ}_{\mathbf{W}} \subseteq \mathbf{T}$, (ii) $\vdash_{\mathbf{T}} \neg \overline{0} = \overline{1}$, 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 $\vdash_{\mathbf{T}} \neg \overline{0} = \overline{1}$.

- 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 $(D \xrightarrow{s})$ to $(D \xrightarrow{s} E)$
- p 507, l 16: delete second)
- p 509, l 14: change \rightarrow to \rightarrow
- p 517, l 12: t should be \mathbf{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 $\sqsubseteq_{\tau_i^+}$ to \sqsubseteq_{τ^+}
- p 549, l 13: change \sqsubseteq_{τ^+} to $\sqsubseteq_{\tau_i^+}$
- p 552, l 3: change 1 to $\mathbf{1}$
- p 562, l 10: change $\mathbf{if}_{\mathbf{N}}(\dots)$ to $\mathbf{if}_{\mathbf{N}}(\dots)$
- p 563 l 11: $\mathbf{s}_1^{-1}(\mathbf{1})$ to $\mathbf{s}_1^{-1}(\mathbf{1})$
- p 564, l 4 of footnote: delete first ","
- p 565, l 6: delete last ")"
- p 565, l 4: change $\mathbf{rrP}(\mathbf{is_0}(\mathbf{2}))$ to $\mathbf{rrP}(\mathbf{is_0}(\mathbf{2}))$
- 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 $[\dots]$ to $[\dots]$
- p 597, column 2, l 15: change $\alpha_{(d_1 \dots d_n)}$ to $\alpha_{(d_1, \dots, d_n)}$
- p 598, column 2, l 7: change \mathbf{T}_S to \mathbf{T}_s