ERRATA

GRAPH THEORY: Modeling, Applications, and Algorithms, by Geir Agnarsson and Ray Greenlaw

September 19, 2018

• 2nd printed page (Library of Congress, etc.): line 3: “Senior Editor” should be “Senior Editor”.

• Page xii, line 4: “Almost all proofs other than of some exceptionally technical theorems” (the crucial words “other than” are missing!).

• Page xvi, line -12: “ot thak” should be “to thank”.

• Page 9, line -13: “g: Y \rightarrow Z” should be “g: Y \rightarrow Z”.

• Page 9, line -3: “h(x) = 1 − \frac{x}{3}” should be “h(x) = (1 − x)/3”.

• Page 12, line “e_6 is adjacent both to itself and to e_5” should be “e_6 is adjacent to e_5”.

• Page 28, Exercise 1.23: “less than relation (\textless)” should be “less than or equal relation (\leq)”.

• Page 29, Exercise 1.27: “G_{gcd(k,n)}” should be “G_{\sigma(k,n)}”.

• Page 30, line 3: should read $E(...)$ = ..., not $V(...)$ = ....

• Page 45, line 2: “is satisfied by the graph on the right, but not by the one on the left.”

• Page 51, line 15: “G_{\sigma(n)}” should be “G_{\sigma(k)}”.

• Page 54, Definition 2.37: In the 2nd itemized condition “i \in \{1,\ldots,k-1\}” should be “i \in \{0,\ldots,k-1\}”.

• Page 56, Figure 2.18: “\phi_1” should be “f_1”.

• Page 61, Exercise 2.3: add assumption that $G$ is simple.

• Page 61, Exercise 2.11: add assumption that $G$ and $G'$ are simple.

• Page 63, Exercise 2.22: should read “... every regular simple graph is regular.”.

• Page 63, Exercise 2.23: should read “Show that if a simple graph $G$ on $n > 1$ vertices...” (since 0 is not a natural number, so 1 is not of the given form).
• Page 63, Exercise 2.30: should read “simple contraction” instead of “contraction” in both places.

• Page 64, Exercise 2.26: the second sentence should read “Viewing these paths as subgraphs of $G$, show that $p_1 \triangle p_2$ constitutes an edge-disjoint union of one or more cycles, possibly along with some isolated vertices.”.

• Page 70, Theorem 3.7, 1st line: the assumptions can be weakened by deleting “simple”.

• Page 85, line -5: “$T \ell$” should be “$T_\ell$”.

• Page 92, line 3: “$i \in \{0, 1, \ldots, n-1\}$” should be “$i \in \{0, 1, \ldots, k-1\}$”.

• Page 94, Exercise 3.7: note that the exercise can be improved by asking that the bound from the previous exercise be proved tight for all $n \geq 2$.

• Page 95, Exercise 3.18: should start “For all $k \geq 0$, show ...”.

• Page 100, Theorem 4.4, as it stands, is not entirely correct: $\tau(G)$ is defined in Definition 4.1 as the number of spanning forests of $G$, so the note right after Theorem 4.4 is wrong, since $\tau(G-e) \neq 0$. However, if we in Definition 4.1 define $\tau(G)$ to be the number of spanning trees of $G$, so $\tau(G) = 0$ if $G$ is not connected, then Theorem 4.4 is correct.

• Page 102, lines 16, 25, 27, 30: “Tree to Prüfer code” should be “Tree from Prüfer code”.

• Page 122, line 12: “$V(e) \geq 0$” should be “$W(e) \geq 0$”.

• Page 125, line 2 (Proof of Theorem 4.40): “$T$” should be “$T_1$”.

• Page 128, Exercise 4.19: restrict to loopless general graphs for the second and third questions. The third question should read “... two adjacent vertices ...” instead of “... two distinct pairs of vertices ...”.

• Page 128, Exercise 4.22: replace “all entries” by “all off-diagonal entries”. Alternatively, limit the assertion to graphs with $n \geq 3$ vertices.

• Page 129, Exercise 4.33: should read “… for any $n \geq 2$, ...”.

• Page 129, Exercise 4.34: add “… , for $n \geq 3$.” at the end of the first sentence.

• Page 130, Exercise 4.38: add assumption that G is loopless.

• Page 130, line -2 (in Exercise 4.39): should read “$W(e)$”, not “$E(e)$”.

• Page 133, Definition 5.1: line 1: “if there are $X$ and $Y...” should read “if there are nonempty $X$ and $Y...”.”
• Page 136, Corollary. 5.8: needs to read “A connected non-Eulerian graph \( G \) has ...” (since a trail is allowed to be closed).

• Page 140, Theorem 5.16: the assumptions can be weakened by deleting “simple”.

• Page 154, Figure 5.12: in the first graph the directed edge \((u_1, u_6)\) is missing.

• Page 156, Exercise 5.11: “...contain 2\( k \) vertices...” should read “contain exactly 2\( k \) vertices...”.

• Page 156, Exercise 5.12: the penultimate sentence of the exercise should read “... the last edge ...” instead of “... the least edge ...”.

• Page 157, Exercise 5.20: This problem doesn’t make sense as is. It should be as follows:

  “Let \( G \) be a simple graph on \( n \) vertices and \( k \) components. Show that

  \[
  d_G(u) + d_G(v) \leq 2n - k - 1,
  \]

  for all \( u, v \in V(G) \). Show further that the upper bound of \( 2n - k - 1 \) can be reached for all \( n \) and \( k \). Also show that if we assume \( u \) and \( v \) to be in distinct components, then the upper bound is \( n - k \), and that this is also sharp.”

• Page 159, Exercise 5.43: the second line should read “contain a directed cycle.”.

• Page 159, Exercise 5.46: the problem is not correct as stated. It should read “Let \( \vec{G} \) be a digraph on \( n \) vertices, and let \( I_n \) be the \( n \times n \) identity matrix. Show that if \( \vec{G} \) is acyclic, then \( I_n - A(\vec{G}) \) is an invertible matrix. Give an example of a simple non-acyclic digraph \( \vec{G} \) where \( I_n - A(\vec{G}) \) is invertible. [Hint: A simple digraph on \( n = 3 \) vertices and 4 directed edges will work].”

• Page 167, Theorem 6.20: should read “For a simple graph \( G \) on two or more vertices, we have...”.

• Page 167, Note 6.21: should read “… for all \( n \geq 2 \).”.

• Page 167, Example 6.22: should read “… integers with \( n - 1 \leq m \leq n(n - 1)/2 \). ...”. (This is so that the Harary graph will be simple.)

• Page 169, Corollary. 6.28: add assumption that \( G \) has no isolated vertices.

• Page 171, Theorem 6.33: condition 3 should read “… there are two paths in \( G \) connecting them which are vertex-disjoint except at the endvertices.”
• Page 187, Corollary 6.54: add assumption that \( u \neq v \).

• Page 187, Theorem 6.55: add assumption that \( u \neq v \).

• Page 188, Theorem 6.56: add assumption that \( u \neq v \) and there is no edge in \( G \) from \( u \) to \( v \).

• Page 189, Theorem 6.57: add assumptions that \( u \neq v \) and \( u \) not adjacent to \( v \).

• Page 190, Exercise 6.5: add at the end “and there is some \( u,v \)-path in \( G \)”.

• Page 190, Exercise 6.6: add the hypothesis that \( G \) has \( n \geq 2 \) vertices.

• Page 190, Exercise 6.7: add the hypothesis that \( G \) has \( n \geq 2 \) vertices.

• Page 191, Exercise 6.13: should read: “any connected simple graph...”. Also, correct the hypothesis to \( n \geq 2 \).

• Page 191, Exercise 6.15: add the hypotheses that \( \Delta \geq 2 \) and \( n \geq \Delta + 1 \).

• Page 192, Exercise 6.26: the hint should read that \( 0 \leq f(e) \leq c(e) \) for every edge \( e \) of the network.

• Page 192, Exercise 6.30: the last sentence should read “In general, is it possible to have an arbitrary number of maximum flows ...”.

• Page 194, Exercise 6.40: the 2nd line should read “Show that for any distinct vertices \( u \) and \( v \), the minimum number ...”.

• Page 194, Exercise 6.41: the 10th line should read “...path in \( \tilde{G} - M_d \),...”, and not “... path in \( G, ... \)”.

• Page 200, Note 7.8: “can made” should be “can be made”.

• Page 201, line 10: “We conclude this chapter” should be “We conclude this section”.

• Page 202, Cor. 7.15: add assumption that \( n \geq 3 \).

• Page 208, Note 7.29, 1st line: should read “...homeomorphic to a given graph \( H \) with no vertices of degree 2, then ...”.

• Page 214, 2nd sentence of 1st paragraph after Note 7.34: should read “A property of graphs which is preserved under taking minors is called hereditary.”

• Page 226, Cor. 7.54: add assumption that \( n \geq 3 \).

• Page 226, Theorem 7.55: should read “... on \( n \geq 3 \) vertices, ...”.

• Page 228, Exercise 7.1: “\( r_2, r_3 \) and \( r_4 \)” should be “\( r_1, r_2 \) and \( r_3 \)”.

4
• Page 229, Exercise 7.5: should read “Let $G$ be a plane graph ...”.

• Page 229, Exercise 7.6: should read “Show that a simple plane graph ...”.

• Page 230, Exercise 7.23: should read “Eulerian” instead of “Euler” in four places.

• Page 230, Exercise 7.26: 2nd line should read “vertex disjoint paths from $u$ to $v$.”.

• Page 231, Exercise 7.28: Theorem 7.59 is not correct as stated. Condition 2 should read “No subgraph of $G$ can be obtained from $K_4$ or $K_{2,3}$ by subdividing edges.”.

• Page 231, Exercise 7.34: should read “... in a simple graph with ...”.

• Page 242, line -2: should read “adjacent” instead of “connected” in both places.

• Page 248, Theorem 8.28: should read “For a loopless planar graph ...”.

• Page 249, Theorem 8.29: should read “For a loopless planar graph ...”.

• Page 249, Theorem 8.30: should read “For a loopless graph $G$ ...”.

• Page 250, Theorem 8.31: should read “For a loopless graph $G$ ...”.

• Page 251, line 10 (first displayed formula): “$2e$” should be “$2m$”.

• Page 253, line 1: “$V(E)$” should be “$E(G)$”.

• Page 259, line 18: “...when $n$ is odd...” should be “...when $n$ is even...”.

• Page 259, line 19: “...when $n$ is even.” should be “...when $n$ is odd.”.

• Page 262, Exercise 8.20: “$d_G(u) \geq \chi(G)$” should be “$d_G(u) \geq \chi(G')$” and “$d_{\overline{G}}(u) \geq \chi(\overline{G})$” should be “$d_{\overline{G'}}(u) \geq \chi(\overline{G'})$”.

• Page 262, Exercise 8.21, part (c): $\ell(G) - 1$ should read $\ell(G) + 1$.

• Page 263, Exercise 8.30: “$n(\frac{k}{2})$” should read “$m(\frac{k+1}{2})$”.

• Page 264, Exercise 8.37: 1st line should read “... a simple graph $G$ ... if $\chi(G) \leq 4$”. 2nd line should read “... a simple planar graph ...”.

• Page 282, Theorem 9.24: Strictly speaking, this theorem should be attributed to Koebe [1] and Andreev [2] in addition to Thurston. Koebe’s original proof only covered the case for fully triangulated planar graphs. Thurston rediscovered the theorem and reduced the
proof to a theorem by Andreev. His proof works for all planar graphs. Thurston never formally published his proof, but a sketch of his proof is in his cited lecture notes. For additional citations and history see [3, p. 118].

• Page 298, Exercise 9.26 part (b): “$C_7^n$” should be “$C_2^n$”.

• Page 306, line -2: “$D = \{u_1, u_5, u_8\}$” should be “$D = \{u_1, u_5, u_I\}$” (as depicted in Figure 10.5.)

• Page 318, line -6: “$a \in A \setminus \{x\}$” should be “$a \in S \setminus \{x\}$”.

• Page 352, Exercise 11.12, line 4: “$F_1 = 0$, $F_1 = 1$” should be “$F_1 = 1$, $F_2 = 1$”.

• Page 368, lines 5 and 6: “... $+2x^2$” should be “... $−2x^2$” in both places.

• Page 417, Exercise 13.7: should read “Is it true that $\log(O(f(n))) = O(\log(f(n)))$? Justify your answer.”.

• Page 444, Index: “Seymour, Paul” and “Seymour, Paul D.” are the same person and should be listed once as “Seymour, Paul D.”. Similarly, “Slater, Peter J.” should be listed once.

References


I will do my best to maintain this errata sheet for further printings and for possible additional editions of the book. Please drop me a line at geir@math.gmu.edu if you find a typo/mistake. On behalf of the authors, Ray and me, I thank you all collectively for your input and help.

Yours, Geir Agnarsson