

ERRATA

GRAPH THEORY: Modeling, Applications, and Algorithms,
by Geir Agnarsson and Ray Greenlaw
Pearson Prentice Hall, 1st printing, (2006)

May 9, 2017

- 2nd printed page (Library of Congress, etc.): line 3: “Seniorr 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: “ $g : Y \mapsto Z$ ” 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 ($<$)” should be “less than or equal relation (\leq)”.
- Page 29, Exercise 1.27: “ $G_{\gcd(k,n)}$ ” should be “ $\vec{G}_{\gcd(k,n)}$ ”.
- Page 30, line 3: should read $E(\dots) = \dots$, not $V(\dots) = \dots$.
- 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 “ $i \in \{1, \dots, k-1\}$ ” should be “ $i \in \{0, \dots, k-1\}$ ”.
- Page 56, Figure 2.18: “ ϕ_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 $p_1 \Delta p_2$ 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_ℓ ” should be “ T_ℓ ”.
- Page 92, line 3: “ $i \in \{0, 1, \dots, n-1\}$ ” should be “ $i \in \{0, 1, \dots, k-1\}$ ”.
- 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 $2k$ vertices...” should read “contain exactly $2k$ 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 $\vec{G} - M_d, \dots$ ”, and not “... path in G, \dots ”.
- 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 ”.

- 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 241, last line of proof of Theorem 8.19 should be “ $(\Delta + 1)$ -vertex coloring...”.
- 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: “ $n \binom{k}{2}$ ” should read “ $m \binom{k+1}{2}$ ”.
- 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_2^7 ” should be “ C_7^2 ”.
- Page 306, line -2: “ $D = \{u_1, u_5, u_8\}$ ” should be “ $D = \{u_1, u_5, u_7\}$ ” (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 417, Exercise 13.7: should read “Is it true that $\lg(O(f(n))) = O(\lg(f(n)))$? 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

- [1] Paul Koebe; Kontaktprobleme der konformen Abbildung, *Ber. Verh. Sächs. Akademie der Wissenschaften Leipzig*, Math.-Phys. Klasse **88**, 141 – 164, (1936).
- [2] E. M .Andreev; Convex polyhedra in Lobačevskiĭspaces. (Russian), *Matematicheskĭĭ Sbornik. Novaya Seriya*, **81 (123)**, 445 – 478, (1970).
- [3] Günter M. Ziegler: Lectures on Polytopes, *Graduate Texts in Mathematics*, **GTM 152**, Springer-Verlag New York Inc. (1995).

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