

Handbook of Graph Theory. Edited by Jonathan L. Gross and Jay Yellen. CRC Press, Boca Raton, Florida, 2004. ISBN 1-58488-090-2, Hardcover. 1167 pp., \$119.95.

The “CRC Handbook” is well-known to anyone who has taken a college chemistry course, and CRC Press has traded on this name-familiarity to greatly expand its “Handbook” series. One of the newest entries to join titles such as the Handbook of Combinatorial Designs, the Handbook of Exact Solutions to Ordinary Differential Equations and the Handbook of Edible Weeds, is the Handbook of Graph Theory. Its editors will be familiar to many as the authors of the textbook, Graph Theory and Its Applications, which is also published by CRC Press.

The handbooks about mathematics typically strive for comprehensiveness in a concise style, with sections contributed by specialists within subdisciplines. This volume runs to 1167 pages with 60 contributors providing 54 sections, organized into 11 chapters. As an indication of the topics covered, the chapter titles are Introduction to Graphs; Graph Representation; Directed Graphs; Connectivity and Traversability; Colorings and Related Topics; Algebraic Graph Theory; Topological Graph Theory; Analytic Graph Theory; Graphical Measurement; Graphs in Computer Science; Networks and Flows.

Each section is organized into subsections that begin with the basic definitions and ideas, provide a few key examples and conclude with a list of facts (theorems) and remarks. Each of these items is referenced with a label (e.g. 7.7.3.F29 is the 29th Fact of Section 7.7, and can be found in Subsection 7.7.3). This makes for easy cross-referencing within the volume, and provides an easy reference system for the reader’s own use. Sections conclude with references to monographs and important research articles. And on occasion there are conjectures or open problems listed too. The author of every section has provided a glossary, which the editors have coalesced into separate glossaries for each of the eleven chapters. The editors have also strived for uniform terminology and notation throughout, and where this is impossible, the distinctions, subtleties or conflicts between subdisciplines have been carefully highlighted.

These types of handbooks shine when one cannot remember that the Ramsey number $R(5, 14)$ is only known to be bounded between 221 and 1280, or one cannot recall (or never knew) what an irredundance number is. For these sorts of

questions, the believable claim of 90% content coverage should guarantee frequent success when it is consulted.

The listed facts never include any proofs, and many do not include any reference to the literature. Presumably some of them are trivialities, but they could all use some pointer to where one can find a proof. The editors are proud of how long the bibliographies are, but sometimes they are too short. In most every case, there could be more guidance about which elements of the bibliography are the most useful for further general investigations into a topic.

An advanced graduate student or researcher of graph theory will find a book of this sort invaluable. Within their specialty the coverage might be considered skimpy. However, for those occasions when ideas or results from an allied specialty are of interest, or only if one is curious about exactly what some topic involves, or what is known about it, then consulting this volume will answer many simple questions quickly. Similarly, someone in a related discipline, such as cryptography or computer science, whose work requires some knowledge of the state-of-the-art in graph theory, will also find this a good volume to consult for quick, easily located, answers. Given that it summarizes a field where over 1,000 papers are published each year, it is a must-have for the well-equipped mathematics research library.

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