

A review of my book in Zentralblatt Math Database by Werner Kleinert (Berlin)

Badawi, Ayman

Abstract algebra manual: problems and solutions. 2nd ed. (English) [Zbl 1067.00001](#)

New York, NY: Nova Science Publishers (ISBN 1-59033-924-X/hbk). vii, 117 p. (2004).

This booklet, the first edition of which appeared in 2001, provides a carefully selected collection of typical exercises for a basic course in abstract algebra, together with utmost detailed models of solution for each of them. As the author points out, the didactic goal of this manual is to help students acquire a solid understanding of the fundamental concepts, methods, and theorems in the theory of algebraic structures through working concrete, challenging and instructive problems. Due to the fact that many (excellent) textbooks of basic abstract algebra merely focus on developing the pure theory, without giving a sufficient array of varying examples, applications, and supporting exercises, and as many students tend to just memorize definitions and theorems, without learning how to use them in, -concrete situations, the present manual certainly furnishes a highly valuable replenishment and aid to the existing textbook literature in the field. As to the topics covered by the exercises (and solutions) in this manual, the author concentrates on groups, rings, and fields at the undergraduate level, omitting the aspect of elementary Galois theory.

There are four chapters of different character, according to the didactic purpose of the manual. Chapter 1 compiles, without proofs, nearly fifty theorems from basic group theory. This is to remind the reader of their statements, of what he/she is supposed to have learned in a basic course, and of what will be necessary for working the problems on groups in the sequel. Chapter 2 is divided into eight sections, each of which provides numerous problems and solutions from various topics in group theory, including subgroups, cyclic groups, permutation groups, cosets and Lagrange's theorem, normal subgroups and factor groups, group homomorphisms, direct products, and the Sylow theorems. Altogether, there are 217 problems treated in this chapter. Chapter 3 recalls, again without proofs, more than fifty fundamental theorems from the basic theory of rings, ideals, and fields. Like Chapter 1, this part is included for the convenience of the reader, recalling the essential tools and results needed for treating the following collection of 174 exercises in Chapter 4. This last chapter is again subdivided into eight sections discussing problems on elementary properties of rings, ideals, factor rings, integral domains, polynomial rings, ring homomorphisms, factorization in rings, fields algebraic field extensions, and finite fields, respectively.

Respecting, the theoretical background material listed in Chapters 1 and 3 the author refers to the widely used standard textbooks on abstract algebra by [J. R. Durbin](#) [Modern algebra. An introduction (New York: Wiley) (1979; [Zbl 0503.00002](#))], [D. S. Dummit](#) and [R. M. Foote](#) [Abstract algebra, 3rd ed. (Chichester: Wiley) (2004; [Zbl 1037.00003](#))], [J. A. Gallian](#) [Contemporary abstract algebra, 4th ed. (Boston, MA: Houghton Mifflin) (1998; [Zbl 0972.00001](#))], [I. N. Herstein](#) [Abstract algebra, 3rd ed. (Upper Saddle River, NJ: Prentice Hall) (1996; [Zbl 0841.00004](#))] and [T. W. Hungerford](#) [Algebra, Reprint (Graduate Texts in Mathematics 73, New York: Springer-Verlag) (1980; [Zbl 0442.00002](#))],

respectively, to all of which -- and also to many others -- this manual provides a useful supplement. The 411 problems discussed in the collection under review are skillfully arranged, varying in their degree of difficulty and challenge as well as in their degree of abstractness or concreteness. However, these problems throughout remain at the undergraduate level, being nowhere too hard or advanced. The author seems to have taken into consideration the various possible proficiencies of beginners in the field, and he tries to encourage the reader by leading him/her from very easy up to rather involved problems at the undergraduate level. The solutions to the exercises are explained, in great detail, with careful references to the underlying concepts and basic theorems. No doubt, students and instructors can profit a lot from this supplementary manual of abstract algebra which, unfortunately, is almost as expensive as many of the comprehensive standard textbooks. However, the fact that this booklet has seen its second edition, within four years, bespeaks its recognition and popularity likewise. Also, there are not many manuals of abstract algebra of this quality in the English textbook literature, which certainly enhances the significance of this one under review. However, it should be pointed out that there are traditionally quite many excellent books of this kind in the French textbook literature, some of which provide both a much broader spectrum and much more advanced problems, together with just as instructive and detailed solutions. As for recommendation to the more ambitious student and/or instructor, we emphatically refer to the recent book "Exercices d'algèbre générale et d'arithmétique" by P. Tauvel [(Sciences SUP, Exercices corrigés, Agrégation –2^e–2^{ec} cycle/Master, Dunod, Paris) (2004)].

Reviewer: [Werner Kleinert \(Berlin\)](#)