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Commutative algebra: constructive methods. Finite projective modules. Translated from the French by Tania K. Roblot. (English) Zbl 1327.13001

Algebra and Applications 20. Dordrecht: Springer (ISBN 978-94-017-9943-0/hbk; 978-94-017-9944-7/ebook). xlix, 996 p. (2015).

The book under review is the faithful English translation of the original French edition published in 2011 under the same title. As for the special character of this voluminous treatise on constructive commutative algebra, its particular features, and its precise contents, respectively, we therefore may refer to our comprehensive review [Zbl 1242.13002] of the French text from four years ago. In fact, having left the latter almost completely unchanged, the authors have confined themselves to the elimination of some errors found in the French original, on the one hand, and to a few additions concerning the contents on the other. More precisely, most of the additional material consists of further solutions to the many exercises and problems complementing each chapter, whereat a number of new exercises has been enclosed as well, Within the main text, the following slight modifications have been made: (1) There is a new paragraph on null tensors in Chapter 4 on finitely presented modules; (2) the paragraph on quotients of flat modules in Chapter 8 now appears somewhat more elaborated; (3) Chapter 15 on the local-global principle in commutative algebra has been extended by two further sections.

As a result, the present English edition of the book now contains 297 exercises and 42 working problems, partly with complete solutions or sketches of solutions.

Compared to the French original, also the numbering within the text has been left unaltered.

Recall from our review [Zbl 1242.13002] that the book comprises seventeen chapters, the precise contents of which are described there. Also, there is an appendix devoted to a few basic concepts of constructive mathematics in the spirit of E. Bishop's classical approach.

As for additional reading, we would like to refer to the authors' related recent textbook [*G.-M. Díaz-Toca* et al., Modules sur les anneaux commutatifs. Cours et exercices. Paris: Calvage et Mounet (2014; Zbl 1305.13001)] as well as to the survey article [*T. Coquand* and *H. Lombardi*, Gac. R. Soc. Mat. Esp. 16, No. 2, 293–312 (2013; Zbl 1304.13047)], both of which may serve as perfect introductions to the more advanced monograph under review.

Finally, it should be emphasized again what we already pointed out in our review [Zbl 1242.13002] of the French edition of this outstanding work in the field of commutative algebra: The book offers a very special, highly unique introduction to various basic concepts, methods, principles, and results from the constructive, explicit and algorithmic point of view, very much so in the spirit of the great developers of constructive algebra in the 19th century, thereby providing an invaluable replenishment of the existing modern textbook literature in commutative algebra.

No doubt, the English edition of this meanwhile standard primer will certainly increase both its international significance and its wider popularity among graduate students, researchers, instructors, and interested scientists in general.

Reviewer: Werner Kleinert (Berlin)

MSC:

13-01 Textbooks (commutative algebra)
13C10 Projective and free modules and ideals
13C11 Injective and flat modules and ideals
13F05 Dedekind, Prüfer, Krull and Mori rings and their generalizations
13C15 Dimension theory, depth, etc. (commutative rings)
13P99 Computational aspects of commutative algebra

Keywords:

textbook (commutative algebra); constructive algebra; computational algebra; projective modules; local-global principle; algebras

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