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## Preface

This book arose from a course of lectures given by the author in the universities of Paris VII and Rome “La Sapienza”. It deals with classical topics in Algebra, some of which have been relegated for a long time to a marginal position, but have been brought to light by the development of the so-called symbolic computation, or computer algebra. I have tried to present them in such a way as to require only the very basic elements of Algebra, and often not even those, emphasising their algorithmic aspects. It is clear that a thorough comprehension of these subjects would be greatly simplified if it is accompanied by exercises at the computer. Many examples of algorithms that may be easily translated into computer programs are given in the text, others may be easily deduced from the theory. The literature on the subject is very rich; the bibliography at the end of the book only mentions the texts and the articles that I have consulted.

The first chapter of the book deals with elementary results like the Euclidean algorithm, the Chinese remainder theorem, and polynomial interpolation. The second chapter considers the  $p$ -adic expansion of rational and algebraic numbers and also of rational functions. The resultant of two polynomials is explained in the third chapter, where many applications are also given (for instance, augmented and reciprocal roots and Hurwitz polynomials). In the fourth chapter the problem of the polynomial factorisation is discussed; in particular, the Berlekamp method is studied in greater detail. Finally, in the fifth chapter we consider the Discrete and Fast Fourier Transform, and also its interpretation in terms of the representation theory of Abelian groups; the  $n \log n$  complexity is also explained.

Every chapter is equipped with exercises, and some results are presented in this form. The text proper does not make use of them, except when specifically indicated.

I have the pleasure to thank the students that have sat in my classes over the years for their remarks and suggestions. I also want to thank Marina Avitabile for her careful reading of the book and her penetrating comments, and Daniele A. Gewurz for his clever remarks and excellent translating job. It goes without saying that I remain the only responsible for possible errors or lack of clarity.

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