

Preface

This book is the result of a series of lectures on linear algebra and the geometry of multidimensional spaces given in the 1950s through 1970s by Igor R. Shafarevich at the Faculty of Mechanics and Mathematics of Moscow State University.

Notes for some of these lectures were preserved in the faculty library, and these were used in preparing this book. We have also included some topics that were discussed in student seminars at the time. All the material included in this book is the result of joint work of both authors.

We employ in this book some results on the algebra of polynomials that are usually taught in a standard course in algebra (most of which are to be found in Chaps. 2 through 5 of this book). We have used only a few such results, without proof: the possibility of dividing one polynomial by another with remainder; the theorem that a polynomial with complex coefficients has a complex root; that every polynomial with real coefficients can be factored into a product of irreducible first- and second-degree factors; and the theorem that the number of roots of a polynomial that is not identically zero is at most the degree of the polynomial.

To provide a visual basis for this course, it was preceded by an introductory course in analytic geometry, to which we shall occasionally refer. In addition, some topics and examples are included in this book that are not really part of a course in linear algebra and geometry but are provided for illustration of various topics. Such items are marked with an asterisk and may be omitted if desired.

For the convenience of the reader, we present here the system of notation used in this book. For vector spaces we use sans serif letters: L, M, N, \dots ; for vectors, we use boldface italics: $\mathbf{x}, \mathbf{y}, \mathbf{z}, \dots$; for linear transformations, we use calligraphic letters: $\mathcal{A}, \mathcal{B}, \mathcal{C}, \dots$; and for the corresponding matrices, we use uppercase italic letters: A, B, C, \dots .

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