Foreword

The beginning student of physics, chemistry, or computer science learns early on that in order to gain a proper understanding of the subject, one has to understand seemingly different topics and their relation to one another. While this is equally true in mathematics, this feature is not brought to the fore in most modern texts of pure mathematics. Different fields are usually presented as complete and isolated topics, and for the most part this is how it should be. However, modern mathematics, abstract as it might appear to the beginner, is driven by concrete and basic problems. In fact many of the different areas were developed in attempts, sometimes successful, to resolve such fundamental questions. Hence it should not be surprising that often the solution to a concrete long-standing problem involves combining different areas. This is especially true of modern number theory. The formulation of the problems is mostly elementary, and the expected truths were many times discovered by numerical experimentation.

In this lovely book the authors introduce number theory in terms of its connections to other fields of mathematics and its applications. While adhering to this theme, they also emphasize concrete problems (solved and unsolved). They develop the requisite mathematical background along the way to ensure proper and clear treatment of each of the many topics discussed. This allows the beginner to get an immediate taste of modern mathematics as well as of mathematical research. Naturally the treatments of various theories and theorems cannot be as complete as in books which are devoted to a single topic; however, through the indicated further reading, the many excellent exercises and the proposed research projects, the reader will get an excellent first understanding of the material.

Parts of this book have been used very successfully in undergraduate courses at the junior level at Princeton, New York University, Ohio State, and Brown. It will no doubt find similar success much more broadly, and it should appeal to both more- and less-advanced students. Covering most of the material in this book is a challenging task for both the student (or reader) and the instructor. My experience in co-teaching (with one of the authors) a version of part of the material is that this effort results in rich rewards for both the student and the instructor.

Peter Sarnak
Princeton, NJ
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