

Preface

Our object is to introduce the interested student to the techniques, results, and terminology of multiplicative number theory. It is not intended that our discussion will always reach the research frontier. Rather, it is hoped that the material here will prepare the student for intelligent reading of the more advanced research literature.

Analytic number theorists are not very uniformly distributed around the world and it possible that a student may be working without the guidance of an experienced mentor in the area. With this in mind, we have tried to make this volume as self-contained as possible.

We assume that the reader has some acquaintance with the fundamentals of elementary number theory, abstract algebra, measure theory, complex analysis, and classical harmonic analysis. More specialized or advanced background material in analysis is provided in the appendices.

The relationship of exercises to the material developed in a given section varies widely. Some exercises are designed to illustrate the theory directly whilst others are intended to give some idea of the ways in which the theory can be extended, or developed, or paralleled in other areas. The reader is cautioned that papers cited in exercises do not necessarily contain a solution.

This volume is the first instalment of a larger project. We are preparing a second volume, which will cover such topics as uniform distribution, bounds for exponential sums, a wider zero-free region for the Riemann zeta function, mean and large values of Dirichlet polynomials, approximate functional equations, moments of the zeta function and L functions on the line $\sigma = 1/2$, the large sieve, Vinogradov's method of prime number sums, zero density estimates, primes in arithmetic progressions on average, sums of primes, sieve methods, the distribution of additive functions and mean values of multiplicative functions, and the least prime in an arithmetic progression. The present volume was

twenty-five years in preparation—we hope to be a little quicker with the second volume.

Many people have assisted us in this work—including P. T. Bateman, E. Bombieri, T. Chan, J. B. Conrey, H. G. Diamond, T. Estermann, J. B. Friedlander, S. W. Graham, S. M. Gonek, A. Granville, D. R. Heath-Brown, H. Iwaniec, H. Maier, G. G. Martin, D. W. Masser, A. M. Odlyzko, G. Peng, C. Pomerance, H.–E. Richert, K. Soundararajan, and U. M. A. Vorhauer. In particular, our doctoral students, and their students also, have been most helpful in detecting errors of all types. We are grateful to them all. We would be most happy to hear from any reader who detects a misprint, or might suggest improvements.

Finally we thank our loved ones and friends for their long term support and the long-suffering David Tranah at Cambridge University Press for his forbearance.