Preface

These lecture notes stem from a course that I gave at the doctoral school in mathematics at Pisa University during the academic year 2013–2014. Their primary purpose is to expound some material well suited for a second course on analytic functions of one complex variable, after a first elementary course dealing with the basic concepts in this theory, such as the residue theorem, Cauchy's integral formula, Taylor and Laurent series expansions, poles and essential singularities, branch points, etc. These basic subjects are the only background assumed in this book; I have made a serious attempt to avoid more advanced prerequisites, sometimes at the cost of choosing slightly longer but more elementary proofs of the theorems.

As the title suggests, however, the topics included have been especially chosen to provide the reader with the main notions and results in the theory of functions of one complex variable leading to a rigorous treatment of some special functions: in the first place, the Euler gamma function, which can be considered the most frequently used non-elementary mathematical function, and, secondly, the most important in the family of hypergeometric functions, namely the Euler–Gauss hypergeometric function ${}_2F_1$ and the Kummer confluent hypergeometric function ${}_1F_1$. These functions are indispensable tools in 'higher calculus' and are often encountered in all branches of pure and applied mathematics. I have tried to treat, on a solid ground, the basic material concerning these functions in the hope of providing a reasonably detailed exposition of their main properties.

The content of these notes is classical, and therefore there is nothing original, except perhaps the selection of the subject matter. Naturally, I have borrowed much from many excellent books, some of which are listed in the bibliography, and it would be impossible to acknowledge in detail all my indebtedness to other authors.

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