

## PREFACE

This book covers six aspects of graduate school mathematics: Algebra, Topology, Differential Geometry, Real Analysis, Complex Analysis and Partial Differential Equations. It contains a selection of more than 500 problems and solutions based on the Ph.D. qualifying test papers of a decade of influential universities in North America. The mathematical problems under discussion are kept within the scope of the textbooks for graduate students. Finding solutions to these problems, however, involves a deep understanding of mathematical principles as well as an acquisition of skills in analysis and computation. As a supplement to textbooks, this book may prove to be of some help to the students in taking relevant courses. It may also serve as a reference book for the teachers concerned.

It has to be pointed out that this book should not be regarded as an all-purpose troubleshooter. Nor is it advisable to take the book as an exemplary text and commit to memory all the problems and solutions and make an indiscriminate use of them. Instead, the students are expected to make a selective survey of the problems, take a do-it-yourself approach and arrive at their own solutions which they may check against those listed in the book. It would be gratifying to see that the students can work out the problems on their own and come up with better solutions than those provided by the book. If the students fail to do so or their solutions may turn out to be incomplete, it may reveal the inadequacy of their knowledge or approach, thus spurring them to greater efforts to promote their skills. The very purpose of the authors in writing the book is just to help the students to discover the truth by trial and error.

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Li Ta-t sien  
Department of Mathematics  
Fudan University  
Shanghai 200433  
China