Student's Preface

This course may well require a different approach than those you used in previous mathematics courses. You may have become accustomed to working a homework problem by turning back in the text to find a similar problem, and then just changing some numbers. That may work with a few problems in this text, but it will not work for most of them. This is a subject in which understanding becomes all important, and where problems should not be tackled without first studying the text.

Let me make some suggestions on studying the text. Notice that the text bristles with definitions, theorems, corollaries, and examples. The definitions are crucial. We must agree on terminology to make any progress. Sometimes a definition is followed by an example that illustrates the concept. Examples are probably the most important aids in studying the text. *Pay attention to the examples.* I suggest you skip the proofs of the theorems on your first reading of a section, unless you are really "gung-ho" on proofs. You should read the statement of the theorem and try to understand just what it means. Often, a theorem is followed by an example that illustrates it, a great aid in really understanding what the theorem says.

In summary, on your first reading of a section, I suggest you concentrate on what information the section gives, and on gaining a real understanding of it. If you do not understand what the statement of a theorem means, it will probably be meaningless for you to read the proof.

Proofs are very basic to mathematics. After you feel you understand the information given in a section, you should read and try to understand at least some of the proofs. Proofs of corollaries are usually the easiest ones, for they often follow very directly from the theorem. Quite a lot of the exercises under the "Theory" heading ask for a proof. Try not to be discouraged at the outset. It takes a bit of practice and experience. Proofs in algebra can be more difficult than proofs in geometry and calculus, for there are usually no suggestive pictures that you can draw. Often, a proof falls out easily if you happen to look at just the right expression. Of course, it is hopeless to devise a proof if you do not really understand what it is that you are trying to prove. For example, if an exercise asks you to show that given thing is a member of a certain set, you must *know* the defining criterion to be a member of that set, and then show that your given thing satisfies that criterion.

There are several aids for your study at the back of the text. Of course, you will discover the answers to odd-numbered problems not requesting a proof. If you run into a notation such as $\mathbb{Z}_n$ that you do not understand, look in the list of notations that appears after the bibliography. If you run into terminology like *inner automorphism* that you do not understand, look in the Index for the first page where the term occurs.

In summary, although an understanding of the subject is important in every mathematics course, it is really crucial to your performance in this course. May you find it a rewarding experience.

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