How to Study
Linear Algebra

A first course in linear algebra is dramatically different from most mathematics courses that precede it. The focus shifts from learning computational procedures to digesting and mastering basic concepts that underlie the computations. To survive, you may need to learn a new way to study mathematics. That's why I wrote this Study Guide—to show you how to succeed in the course and to give you tools to do this.

Because you are likely to use linear algebra later in your career, you need to learn the material at a level that will carry you far beyond the final exam. I believe that the strategies below are crucial to success.

STRATEGIES FOR SUCCESS
IN LINEAR ALGEBRA

1. Study before you start to work on exercises. Most students don’t do this in courses that precede linear algebra. They survive by looking at the examples when they cannot solve an exercise. That simply will not work in linear algebra. If you “copy” an example (with necessary modifications), you may think you understand the problem, but very little true learning has taken place. (You’ll find that out on your first exam.) For this course, in addition to knowing how to carry out a certain procedure, you must learn when that procedure is appropriate and (most importantly) why it works.

   For success with homework, read the text section first, perhaps taking a few notes. Then, read the Key Ideas or Study Notes in the Study Guide for that section. Finally, start to work on the assigned exercises. In the long run, this approach will improve your performance and save you time. The preparation time spent here will greatly reduce your exam preparation.

2. Prepare for each class period as you would for a language class. Mastery of the subject requires that you learn a rich vocabulary. Your goal now is to become so familiar with concepts that you can use them easily (and correctly) in conversation and in writing. For homework, try to write complete sentences, such as you’ll find in the Study Guide solutions. Pay attention, too, to the warnings here about misuse of terminology.
This course resembles a language course because of the preparation needed between class meetings, to avoid falling behind. Most sections in the text build on preceding sections. Once you are behind, catching up with the class is often difficult. The fact that concepts may seem “simple” does not mean that you can afford to postpone your study until the weekend. The homework may be harder than you expect. The most valuable advice I can give is to keep up with the course.

3. **Concentrate more on learning definitions, facts, and concepts** than on practicing routine computations or algorithms. See connections between concepts. Many theorems and boxed “facts” describe such connections. For examples, see Theorem 2 in Section 1.2, and Theorems 3 and 4 in Section 1.4. Your goal is to think in general terms, to imagine typical computations without performing any arithmetic, and to focus on the principles behind the computations.

4. **Review frequently**. Review and reflection are key ingredients for success in learning the material. At strategic points in this Guide, I have inserted special subsections labeled “Mastering Linear Algebra Concepts.” They provide specific help for your review of each main concept. I urge you to prepare the review sheets described as you reach each review point. Later, you may choose to add further notes. Of course, use the sheets to review for exams. A Glossary Checklist at the end of each chapter in the Guide may help you learn important definitions.

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**CAUTION**  Because you can find complete solutions here to many exercises, you will be tempted to read the explanations before you really try to write out the solutions yourself. Don’t do it! If you merely think a bit about a problem and then check to see if your idea is basically correct, you are likely to overestimate your understanding. Some of my students have done this and miserably failed the first exam. By then the damage was done, and they had great difficulty catching up with the class. Proper use of the Study Guide, however, will help you to succeed and enjoy the course at the same time.

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**A PERSONAL NOTE**

Students who have used this material have told me how much it helped them learn linear algebra and prepare for tests. The first time my students used the Study Guide notes, they had already taken one exam. Grades on the next exam were substantial. For some students, the improvement was dramatic. I hope the Study Guide will encourage you to master linear algebra and to perform at a level higher than you ever dreamed possible.

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