

Linear algebra is a subject where you have to "See for yourself!" Instead of being told, "This is how it works," make up your own matrix. Ultimately a matrix is just a block of numbers. Make up your own numbers and see what happens! Play around. If you think some statement about matrices may be true, make up some matrices and see if the statement is true or not. Because matrix computations are tedious and time-consuming to do by hand, it helps to use an online resource or a computer program to do the computations for you.

The most important thing to do is the exercises. Reading explanations will get you started, but to understand the material well, you have to think about the material a lot. The expository material introduces the main ideas and concepts. But in order to understand the math, you have to do the math. You are supposed to be stuck on many of them. In the process of getting unstuck, you will learn the content. You should be asking questions, going back to reread a section to review something, and asking yourself how what you have read can be applied to solve the problem. You learn in the process of going from not knowing how to do the problem, to figuring it out. This is doing the regimen! As you successfully complete each exercise, you will build up your knowledge a little bit. Over time, it will add up and you will have a good understanding of the material.

Later material builds on earlier material, and it is easy to get confused if you don't understand what was discussed before. Use the end-of-chapter questions as a test to see if you understand enough to move on. If you are missing many of them, go back and reread the relevant sections, possibly reviewing some exercises.

Come up with questions. Ask yourself questions as you read the text and think about the problems. Why is this statement true? How does this concept I am learning now relate to another concept I have learned?

Read slowly and pay attention. Don't even think about learning this material by skimming the chapters. When you come to a definition, read it carefully. Come up with examples and non-examples. Linear algebra has a lot of technical terms. It is important to know the technical definitions cold, not just have a vague idea of what the words mean. Precision is important in math. When I use the word "eigenvector," I mean it exactly the way it was defined. So you will be confused if you do not know exactly how the word is defined.

Because there is an emphasis on conceptual understanding and because there are a lot of technical terms, when you read a question, the first thing on your mind shouldn't be, "How do I do this?" It should be, "What is the question even asking?" Rephrase the

question in ordinary English. You may find that the problem is actually really easy, once you understand exactly what it is that you are asked to do. But in order to do this, you have to know the precise definitions.

The concepts and theorems are general and abstract, but this is part of the usefulness of the subject. When you see an example, think about how it generalizes to other situations. For example, suppose you do a computation involving a 2 by 3 matrix. Ask yourself, how would it work with a 1,000 by 5,000,000 matrix? If you are learning a general theorem and only know how it works for a 2 by 3 matrix and do not see how the exact same principle applies for a 1,000 by 5,000,000 matrix, then you are missing the general principle.

If I had to summarize my tips, they would be: (1) See how the theory works in many examples, and (2) Don't try to learn this material passively, by just watching videos and listening to other people explain things. Build up your own knowledge. Be an active participant in your own learning.

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