

Math 331 Quiz # 2 Review Sheet

By: The Brain

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Hello everyone. This is the Brain—soon to be your new world ruler. Since the latest of my attempted world domination schemes has failed at the hands of my own sidekick, Pinky, I thought I'd take a night off to write this sheet for you about the upcoming quiz on 2/22. Tomorrow I'll get back to trying to rule the world! ROCK ON!

1. Section 4.3: Subspaces. This was the section we sort of skipped in lieu of studying linear independence and spanning issues right before the test. I would know what a subspace is and how to use the *test for a subspace* on page 193. Of course, that numbskull Corey covered this in class.
2. Section 4.5: Basis and Dimension. If you'll recall, Section 4.4 was covered before the exam, and so Corey won't be asking any questions specific to section 4.4. This doesn't mean you won't have to know the material, of course, and Section 4.5 is a great example of this. You'll definitely need to know all about the concept of a basis, and the concept of dimension. All of the shaded Theorems that you see on pages 215 through 223 are very important and will immensely help your understanding of this material. All of the homework questions 5–11, 13, 14, 23–27, 35, 44, 47, 48, 57–62 and 66 are all good homework questions. They ask you if certain sets of vectors are bases, and why or why not. They also ask you about extending sets of vectors to a basis, and the theoretical questions, which surround these issues as well, are very good. I sort of get the impression from pondering what might be on this quiz that Corey really cares about the notions of basis and dimension.

3. Section 4.6: The Rank of a Matrix and Systems of Linear Equations. For this section it is important to know the definitions of column space, row space, and null space. Accordingly, you should know how to find bases for these subspaces, especially the null space (also called the kernel). Like Corey pointed out in class, these subspaces are the next most important non-artificial subspaces we can study (associated to a matrix) and it's a very basic question to ask what a basis for each of these subspaces is (that doesn't mean it's easy, just that it's a basic question associated to this material). Keep in mind, the answers to these questions are all related to the reduced row-echelon form of a matrix, and I would get good at finding these bases. We noticed that the dimension of the column space and the dimension of the row space were equal: this common number was called the *rank* of the matrix, and it will be of utmost importance later. In fact, I've been reading some of Corey's research papers and his doctoral dissertation and have found him referring to the rank of a certain object in several places. I also saw the word "kernel", not not "null space". He must prefer "kernel". In any event, these are important subspaces, and understanding how to find a basis will be important. The "rank-nullity" theorem also was important, as was a list of equivalent conditions on a square matrix A . I wouldn't really memorize these, but rather know that any of these conditions implies any of the others. It's an extremely powerful list of results that we'll refer to often.
4. General information. The quiz won't cover 4.7, although we'll be doing that in class a week before. I'd rather everyone know what material we'll cover and not deluge you for the quiz. 4.7 will be on the exam, though. I really don't have very many other suggestions for you besides the suggestions I had for the first quiz and test. Just study, look over the homework, and rock out as hard as possible! If you do have any questions, feel free to contact Corey, I'll be out trying to rule the world with a huge paper machee world! Free T-shirts, anyone? Oh, and

ROCK ON!