

Math 331 Final Exam Review Sheet

The Warner Brothers Logo

March 12, 2007



Hello, wonderful television and movie viewers! This is the Warner Brothers logo here to divulge, in my infinite wisdom, information about the Math 331 final exam! Enjoy!

1. Sections 6.1, 6.2 and 6.3: Linear Transformations. Chapter 6 really is the bridge between the world of the specific, and the abstract, as far as matrices and functions are concerned. See, a lot of the course has gone like this, and it's likely you haven't ever been aware of it. Remember talking about \mathbb{R}^n ? Then I told you that \mathbb{R}^n was really just an example of something called a vector space? Then it was that the dot product was really just an example of an inner product? Well now, a matrix (when viewed as a function via matrix and vector multiplication on the right) is just a specific example of a linear transformation. The difference in this case is that it depends very much on the basis for the vector spaces you're going between. I'd first memorize the definition of a linear transformation. Then I'd sit down and go over the notes about how we can represent a linear transformation between finite dimensional vector spaces as a matrix, but only after a basis for the domain and range have been selected. In general, changing the basis will change the entries of the matrix that represents the same linear transformation. When you and I choose these bases, though, then things get easy. Suppose my basis for the domain is $\{v_1, \dots, v_n\} = \mathcal{B}$. What you would do to find the matrix for a given linear transformation T is two things: first, look at where T sends these basis vectors, and be sure to express them in terms of your basis for the range. Next, express these images $T(v_i)$ as column vectors with respect to your basis (this should be straightforward, since you already

expressed these answers in terms of your basis. The columns of your matrix are formed by the column vectors you just found.

Now, if you'd like to find the matrix with respect to a different basis (in either the domain, or range), just follow the same steps. See, the work that you'll do will be in translating each of the new basis vectors in terms of the old basis, and interpreting the information accordingly. See the class notes for more on this. Corey will review a little of this in class on Tuesday March 13th, and tell you about a simple situation where the linear transformation is just a map from one vector space to itself.

Corey will also cover information such as the *kernal* of a linear map, the *range*, and the notion of an isomorphism. The *isomorphism* is quite possibly the most important mathematical notion anyone will have seen in their mathematical training up to this point.

2. General Final Exam Info. The information for our final exam is as follows:

Math 331 Final Exam
Thursday, March 22, 2007
6–8 PM

You can expect that the final exam will cover the topics that we've visited throughout the entire course. Yay!!!! As the purveyor of such great shows as "Pinky and the Brain" and "Batman the Animated Series", I must say I'm excited about the final exam! I would expect to see a lot of the types of questions Corey has put on all of the quizzes and exams thus far. They, and your homework, and your class notes will likely be your best source of information and practice with regard to the final exam. After all, why would Corey bother preparing you for these questions by asking you these questions on quizzes or tests if we wasn't going to ask you the same sorts of things for the final exam? Other than that, it's been a really wonderful term, and for the last time I'll say:

ROCK ON!!!