

About the exams of  
MATH 2207, Linear Algebra  
Semester 2, 2018

This document applies to questions in this class in general, on the quizzes, midterm and final.

In your exam answers, I am looking for **understanding**, not simply the correct numerical answer. As a consequence:

- The majority of questions will be **solving problems you haven't seen before** (i.e. different from homework), and they will require you to put together ideas from different topics.
- The majority of questions are designed to be solved conceptually, without long calculations (see below).
- You must explain your solution with words; calculations alone will not be enough. (see below).
- If you don't know how to solve a question, you will gain more points by writing down the definitions of any terms in the question, than by doing a calculation that you hope is relevant.
- Arithmetic error will usually only cost 1 or 0.5 points, so you should not worry too much about these (unless they are used in later parts of the problem).
- In contrast, **statements that are mathematically incorrect can lose many points**, as this tells me that you don't understand. Some common examples: inverting a non-square matrix, " $AB = \text{zero matrix so } A = 0$ ", "the eigenvector is  $0$ ", ...

Some more information about the questions:

- The questions (or part-questions) are **not** in order of difficulty. So you should look for part-questions that you can do easily, instead of working through the questions in order.
- Some questions are very short and some questions are very long.
- The questions are in many parts:
  - The parts are loosely related (e.g. they may be about the same matrix).
  - There are usually both easy parts and hard parts within the same question.
  - You don't always need the answer to part a) to answer part b).
  - Sometimes part b) depends on the information given in the question of part a), but not on the answer to part a).
  - Even when part b) depends on the answer to part a): If you have the wrong answer to part a) and therefore a wrong answer to part b), you may still get full marks for part b) if I think you would've got the right answer if you had the right answer to part a).
- There will be some very hard questions, to challenge you - you are not expected to solve them completely. Sometimes these questions are marked **Explain your reasoning carefully**.

- If a question says “write down” (not “find” or “calculate”), then it usually means no calculation is necessary. But you still need to explain your answer.
- If a question asks for “all value(s) of  $a$ ” such that some condition is true, then it is possible for the answer to be “all of  $\mathbb{R}$ ” (i.e. the condition is true regardless of the value of  $a$ ), or “the empty set” (i.e. there is no value of  $a$  that makes the condition true).

Some suggestions for how to study:

1. Review the material:

- Make sure you know your “routine computations” (e.g. row-reduction, determinant, standard matrix).
- Make sure you know the definitions (e.g. span, linear independence), not just how to calculate them.
- Make a list of the important definitions, theorems, and ideas (e.g. pp13-14 of week 3) - you should do this throughout the class, not just before exams.
- For each key idea, go through your notes and make a big list of where it occurs in the different topics, so when that idea comes up in a question you know what tools you can use.

2. Do practice problems:

- Close your notes and redo homework problems or in-class exercises that you had trouble with;
- The exercises in the textbook have answers in the back;
- You can look online for more problems - linear algebra is a popular course so there are many class webpages with good notes or problems. Once you have mastered your routine computations, you should look for unfamiliar problems.
- If you want to check your solutions to any problems, you can always bring them to office hours.

In the exam itself:

- Please be neat! If I cannot read your answer, then I cannot give you points. Using pencil or an erasable pen is better than crossing many things out.
- Please **start each question on a new page**. If you are skipping a question, please leave a lot of space. Make it easy for me to find your answer.
- Please **show all steps** in your calculations: a final answer without supporting work will not get full credit. In particular, show **all your steps in row reduction**. In the final, you will have spare paper for draft calculations, but **only what is in the answer book will be graded**.
- Before you start a long calculation, take 30 seconds to see if there’s a short conceptual solution. If you don’t see it, leave it and come back later. A long calculation uses a lot of time and effort for relatively few points. Only solve questions using a long calculation if there is nothing else on the exam that you can do.
- In questions that are not routine calculations, explain **why** your calculations solve the problem, e.g. “ $\det A = 3 \neq 0$  so  $A$  is invertible”; “ ”.

- Explain any symbols you use that are not given in the question, e.g. “let  $A$  be the matrix whose columns are  $\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3$ .” Otherwise I might not understand your solution, and I can’t give points.
- Please check your answers after each step! (e.g. after solving  $A\mathbf{x} = \mathbf{b}$ , you should calculate the product of  $A$  and your  $\mathbf{x}$  to make sure it equals  $\mathbf{b}$ .) Getting a wrong answer in one step might make the next step much harder. You don’t need to show me your answer-checking, but I may be harsh on arithmetic error in questions where you can check your answer. If you really cannot find your mistake, at least tell me e.g. “my solution does not satisfy  $A\mathbf{x} = \mathbf{b}$  so I must have made an arithmetic error”.

The make-up / supplementary exam is harder than the final, to take into account that you had extra time to study. So please don’t study so hard that you get sick on the day of the final! Take care of yourselves, eat healthily and get enough sleep. Sleep is very important to ensure that you can work carefully and quickly in the exam.