About the exams of
MATH 2205, Multivariate Calculus
Semester 2, 2017

- The midterms are roughly one hour - maybe slightly shorter, maybe slightly longer. The material tested will be confirmed nearer the time.
- The questions in Midterm 2 may require material already tested on Midterm 1.
- The final is 2 hours. The questions will cover everything in the course, including material already tested on the midterms.
- Calculators are allowed, for arithmetic only.
- You will be given the usual formula sheet. You are **not** allowed to bring any notes.

About the questions:

- The questions are **not** in order of difficulty. Depending on your speed, you might not have a lot of time, so it is important that you skip any questions that are hard for you and solve everything you find easy first.
- The questions are harder than in-class exercises.
- Some questions will involve ideas from different parts of the class.
- The questions may have many parts / subquestions:
  - The parts are loosely related (e.g. they may ask you to do different things with the same function).
  - 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).
- Questions marked "**Explain your reasoning carefully**" are designed to be challenging and to test your conceptual understanding.
  - There will be partial credit for good ideas and attempts.
  - To get full points, you must explain your answer fully. Make it clear to me that you know what you are doing and are not simply guessing.
- Make sure you know the difference between these questions:
  - "Show that (a, b) is a critical point of f."
  - "Show that (a, b) is the **only** critical point of f."
- Make sure you know the difference between these questions:
  - "Find the volume (or mass, centroid, average value etc.) of R."
  - "**Express as an iterated integral** the volume (or mass, centroid, average value etc.) of R."
- Remember that, 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).

The best way to study is to do practice problems:

- Close your notes and redo homework problems or in-class exercises that you had trouble with;
- There are lists of textbook practice problems on the class webpage, on the far right hand column of the calendar inside the schedule tab;
- If you want more challenging problems, you can try the Chapter Review sections of the textbook;
- You can look online for more problems - multivariate calculus is a popular course so there are many class webpages that may have good notes or problems. But be careful that different classes teach different material so problems online might be out of our syllabus - if you are not sure, you can email a picture of specific problems to ask whether they are relevant.
- If you want to check your solutions to any problems, you are very welcome to bring them to office hours. You can also check computations with computer software, e.g. wolframalpha.com

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. This is especially true for diagrams.
- In the midterms, you write on the question paper. You can write on the back pages. If you use the back pages, please indicate clearly that your answer is there.
- In the final, you write in an answer book. There is no blank paper for drawing diagrams. If you want to draw on paper without lines (which I recommend), please draw on the inside covers or the back of the answer book (the coloured pages).
- In the final, please start each question on a new page of the answer book. If you are skipping a question, please leave a lot of space. Make it easy for me to find your answer.
- Please show **all the steps** in your calculations: a final answer without full supporting work will not get full credit. If you are given scratch paper, that is for your "experimentation" when you try to find a possible solution. Your official answer must contain the entire solution.
- If you use symbols that are not defined in the question, please tell me what they are.
- In long problems, you should double-check your answers after each step, because getting a wrong answer in one step might make the next step much harder. For example:
  - In multiple integration questions, check your limits and your integrand. If you get an impossible integral, maybe your limits / integrand are wrong, or maybe you made a mistake calculating the first integral in your iterated integral.
  - In extremisation questions, check that your first derivatives are correct, or your equations may be very hard to solve.

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.