

MATH 207 Multivariate Calculus (Non-Specialist)  
Fall 2015

**Lectures:** 11:30-12:20 MWF in MC 4064

**Tutorials:** 4:30-5:20 Wednesdays in MC 4064

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**Office hours:** 3 – 4 Thursdays

**Phone:** 519-888-4567 Ext: 32618

**Text:** *Essential Calculus*, University of Waterloo ed., by James Stewart

**Website:** I will use Learn for the purpose of distributing assignments, and for the occasional announcement (for example, test locations). If you wish to send me a message, please use [ptsmith@uwaterloo.ca](mailto:ptsmith@uwaterloo.ca); I do **not** check the Learn message board in a timely way.

**Lectures:** Students are expected to attend all lectures. An approximate outline of the topics covered in the lectures is: 1) Basic geometry in  $\mathbb{R}^3$ ; 2) Vector functions, derivatives and integrals; 3) Multivariable functions and partial derivatives; 4) Gradients; 5) Optimization including Lagrange multipliers; 6) Multiple integrals and applications in non-rectangular coordinate systems; 7) Line integrals, Green's Theorem, Curl, Divergence; 8) Introduction to Fourier Series. This material is to be found in chapters 10 - 13 in the textbook, plus a handout later.

**Assignments:** There will be approximately ten assignments. Each assignment will be due by 11 am on Fridays each week in our dropbox, Box 3, Slot 9. Late assignments will not be accepted. On assignments, in the upper right hand corner of the first page please put your full name (and please underline your family name), the assignment number, the course designation (Math 207), and the date. Unclaimed assignments will be retained for one month after term grades become official in Quest. After that time, they will be destroyed in compliance with UW's confidential shredding procedures.

**Tutorials:** Tutorial sessions are held 4:30-5:20 on Wednesdays in MC 4064. Tutorials will usually consist of the solution of several examples, followed by a time for asking individual questions. A graduate student will be in the tutorial room to help students while they work on their weekly assignments. Students are strongly encouraged to start work on their assignments before coming to the tutorials. The first tutorial will be Wednesday, Sept 23, 4:30-5:20.

**Calculator Policy:** In general, calculators are not allowed on tests and exams. If they are allowed for a specific test, only non-programmable, non-graphing, non-integrating, single-line-display calculators will be allowed. Check with me beforehand to verify whether your calculator is okay.

**Electronic Gadgets:** Cellphones and laptops are not permitted out during class. Turn all cellphones off for the duration of the lecture.

**Tests:** There will be a midterm test and a final exam. The midterm will be Wednesday, Oct 28, at 4:30 to 5:20 in MC 4064. The final exam will be comprehensive, and scheduled by the Office of the Registrar.

**Course Mark:** The final course grade will be computed using the maximum of the following two marking schemes:

$$G = 15\%A + 30\%T + 55\%E \quad \text{or} \quad G = 25\%A + 75\%E$$

where A is the average assignment mark, T the average test mark, and E the final exam mark.

**Students with Disabilities:** The AccessAbility Service, located in Needles Hall, Room 1132, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the AAS at the beginning of each academic term.

### **Academic Discipline:**

It is in your best interest to try to solve all of the assignment problems independently. Although it is permitted to discuss assignment problems with each other, you are expected to write up your solutions independently. Direct copying (from any source) is plagiarism, and will be treated as an academic offense.

*Academic Integrity:* In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility.

*Grievance:* A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70 - Student Petitions and Grievances, Section 4, <http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm>

*Discipline:* A student is expected to know what constitutes academic integrity, to avoid committing academic offenses, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offense, or who needs help in learning how to avoid offenses (e.g., plagiarism, cheating) or about rules for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 - Student Discipline. For information on categories of offenses and types of penalties, students should refer to Policy 71 - Student Discipline, <http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm>

*Avoiding Academic Offenses:* Most students are unaware of the line between acceptable and unacceptable academic behaviour, especially when discussing assignments with classmates and using the work of other students. For information on commonly misunderstood academic

offenses and how to avoid them, students should refer to the Faculty of Mathematics Cheating and Student Academic Discipline Policy,  
[http://www.math.uwaterloo.ca/navigation/Current/cheating\\_policy.shtml](http://www.math.uwaterloo.ca/navigation/Current/cheating_policy.shtml)

*Appeals:* A student may appeal the finding and/or penalty in a decision made under Policy 70 - Student Petitions and Grievances (other than regarding a petition) or Policy 71 - Student Discipline if a ground for an appeal can be established. Read Policy 72 - Student Appeals,  
<http://www.adm.uwaterloo.ca/infosec/Policies/policy72.htm>

### **How to succeed in this course:**

The purpose of studying mathematics is to learn how to think logically, how to ask questions, and how to solve problems. If you understand the basic concepts, you will be able to apply them in solving problems. For this reason, it is important that you spend time studying your lecture notes and the text, before you work on the assignments. But then you must do the work. Mathematics is learned by doing, not watching someone else do it. It is only with practice that you will become proficient.

In the mathematics courses at U of Waterloo we require that you write well-organized and readable solutions, using sentence form. By writing a well-organized solution, you will also develop a better understanding of the method. There are certain components of a solution which are essential:

- An introductory statement: what you are given and what you have to show/find;
- Some sentences of guidance for the reader, e.g. state how you are going to solve the problem;
- Justifications of the main steps: refer to definitions, rules, and known properties;
- A concluding statement: summarize the conclusion briefly.

Useful steps in general:

0) If you think you need to brush up your study skills, or just find a better way to get yourself organized, check out the Study Skills webpage offered by the UW Counselling Services at [www.adm.uwaterloo.ca/infocs/study/index.html](http://www.adm.uwaterloo.ca/infocs/study/index.html)

1) Read the book. The weekly schedule tells you what section(s) we will cover each day, so read the section before coming to the lecture. This will give you an idea of the topic.

2) Work the examples in the book while you read. If you don't see how the logic flows, put a sticky note next to the problem and ask about it during class.

3) After the lecture, read each section a second time before tackling the assignment. Course notes will be published on ACE.

4) Reflect on the principles, seek patterns, ask questions, understand the whole picture.

5) Show off on the tests.

If you have any difficulty, it's best to start reviewing and getting help right away. Don't delay.

**Schedule:** Here is an approximate weekly schedule of the topics which will be covered.

| Week | Days                 | Topics   | Text Sections          | Assignments             |
|------|----------------------|--|------------------------|-------------------------|
| 1    | Sept 14 - 18         | Vectors, Dot Product, Cross Product, Equations of lines and planes   | 10.2 – 10.5            | No assignment           |
| 2    | Sept 21 - 25         | Cylinders and quadric surfaces, Vector functions and space curves, Derivatives and integrals of vector functions, Arc Length | 10.6 --10.8            | 10.2 – 10.5 due Sept 25 |
| 3    | Sept 28, 30<br>Oct 2 | Functions of several variables, Limits and continuity, Partial derivatives,  | 11.1 - 11.3            | 10.6 – 10.8 due Oct 2   |
| 4    | Oct 5 - 9            | Tangent planes and linear approximations, Chain rule, Directional derivatives and the gradient                               | 11.4 – 11.6            | 11.1 – 11.3 due Oct 9   |
| 5    | Oct 14, 16           | <b>Thanksgiving holiday Oct 12</b><br>Maxima and minima, Lagrange multipliers  | 11.7 – 11.8            | 11.4 – 11.6 due Oct 16  |
| 6    | Oct 19 - 23          | <b>No lecture Oct 21</b><br>Double integrals, Double integrals in polar coordinates  | 12.1 - 12.2, 9.3, 12.3 | 11.7, 11.8 due Oct 23   |
| 7    | Oct 26 - 30          | <b>Midterm Wednesday Oct 28, 4:30</b><br>Applications, Triple integrals  | 12.4, 12.5             | No assignment           |
| 8    | Nov 2 - 6            | Triple integrals in cylindrical coordinates, Triple integrals in spherical coordinates, Jacobean                             | 12.6 - 12.8            | 12.1 – 12.4 due Nov 6   |
| 9    | Nov 9 - 13           | Vector fields, Line integrals, Fundamental Theorem for line integrals  | 13.1 – 13.3            | 12.5 – 12.7 due Nov 13  |
| 10   | Nov 16 - 20          | Green's Theorem, Curl and Divergence   | 13.4, 13.5             | 13.1 – 13.3 due Nov 20  |
| 11   | Nov 23 - 27          | Fourier Series   | Handout                | 13.4, 13.5 due Nov 27   |
| 12   | Nov 30 - Dec 4       | Fourier Series   | Handout                | Fourier set due Dec 4   |
|      | TBA                  | <b>Final Exam</b>  |                        |                         |

## Practice Problems for MATH 207

- 10.3 1, 5, 7, 9, 13, 15, 17, 23, 25, 31, 35, 37, 45, 51
- 10.4 1, 3, 7, 11, 13, 19, 25, 29, 33, 35, 37, 39, 41
- 10.5 5, 9, 13, 17, 19, 25, 29, 35, 49, 55, 57
- 10.6 11, 15, 19, 27, 31
- 10.7 3, 5, 9, 13, 17-22, 23, 24, 27, 29, 33, 39, 43, 45, 51, 59, 63, 65, 75
- 11.1 1, 3, 5, 9, 13, 15, 17, 19, 21, 23, 25, 27, 41 – 46, 47
- 11.2 1, 3, 7, 9, 11, 13, 15, 19, 21, 25, 31
- 11.3 1, 5, 11, 15, 23, 29, 31, 35, 41, 43, 45, 49, 51, 57, 61, 65, 69, 73, 79
- 11.4 1, 5, 11, 15, 21, 25, 31, 33
- 11.5 1, 5, 11, 13, 17, 21, 27, 31, 37, 45
- 11.6 1, 5, 9, 13, 17, 23, 31, 39, 43, 47, 49
- 11.7 1, 3, 9, 13, 23, 31, 35, 39, 45
- 11.8 1, 5, 9, 15, 19, 27, 29, 33, 37, 41
- 12.1 1, 5, 9, 11, 23, 31, 35
- 12.2 1, 7, 11, 13, 15, 23, 27, 31, 33, 41, 43, 49, 51, 55, 59
- 12.3 1, 3, 7, 11, 17, 21, 25, 29
- 12.4 1, 5, 9, 15, 19, 23
- 12.5 1, 5, 11, 17, 23, 29, 31, 39, 41, 49
- 12.6 1, 3, 5, 7, 9, 17, 21, 27, 29
- 12.7 1, 3, 5, 7, 9, 17, 21, 27, 33, 39
- 13.1 1, 7, 23, 29
- 13.2 1, 7, 11, 17, 21, 31, 37, 43, 47
- 13.3 1, 7, 11, 17, 21, 25, 31
- 13.4 3, 7, 11, 17, 29
- 13.5 1, 5, 9, 11, 17, 25, 29, 35