

Math 217 - Calculus 3 for Chemical Engineering

Fall 2011

University of Waterloo

Lectures: Mondays 08:30-10:20 in MC 2038 and Tuesdays 08:30-09:20 in RCH 309

Tutorials: Fridays 08:30-09:20, RCH 309

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Objective

To present the standard concepts and methods of multivariable calculus, including partial derivatives and chain rules, optimization, multiple integration and vector calculus. Applications in engineering will be emphasized.

Prerequisite

Math 118 (Calculus 2 for Engineering).

Textbook

Calculus For Engineers, Fourth Edition, by D. Trim (Prentice-Hall, 2008).

Final grade

It will be calculated using the following weighting:

- Assignments: 10%
- Mid-term exam: 30%
- Final exam: 60%

The dates and times of the exams are to be determined.

Lectures

The MATH 217 course material will be defined primarily by the lectures. These lectures will cover selected portions of the textbook but not necessarily in the order presented in the book. (There are many details in the book that must be omitted because of lack of time.) In addition, there will be some material presented in the lectures that is not to be found in the textbook. For all of these reasons, it is imperative that you keep up with the material presented in lectures. I am planning to post my lecture notes at the end of each week on UW-ACE.

Assignments

You will be asked to submit eleven short assignments. They will normally be set on Monday mornings and will normally be due two weeks later. **They can be submitted in drop box number 3, slot numbers 11 and 12. These are labelled for Math 217 and are separated alphabetically into A-L and M-Z. Please submit your assignments in the slot associated with the first letter of your last name, and do not forget to include your name and student ID number on the assignment. The drop box is located in the bank of pink drop boxes on the 3rd floor of MC, across from the doors for the DC overpass. Late submissions will not be accepted.** The ten best assignments will count for 10% of the final grade. Your assignment solutions should be legible, detailed and well-organized, indicating the logic and methods used in obtaining the answer, *not merely a scribble of formulas and equations*. Solutions to a selection of the assigned problems will be posted on UW-ACE. Although they formally constitute only 10% of your final grade, the problem sets should be considered as the essential component of this course. The midterm and final examinations in MATH 217 will reflect the spirit of the problem sets. Past experience has shown that students' performance in this course (i.e., their final grades) is strongly linked to the effort that they put into assignments.

Math 217: Course Outline

1. **Vectors and three-dimensional analytic geometry** (Trim, Ch. 11)

Curves and surfaces (11.2)

Vectors and work (11.3, 11.4, 11.5, 11.7)

Parametric representations of curves (11.10)

Vector valued functions and vector representations of curves (11.10, 11.9)

Displacement, velocity and acceleration (11.13)

Motion along a curve (11.11, 11.12)

2. **Differential Calculus of Multivariable Functions** (Trim, Ch. 12)

Multivariable functions and contour plots (12.1)

Partial derivatives (12.3, 12.5)

Differentials (12.14)

The chain rule for multivariable functions (12.6)

Gradients, tangent planes and directional derivatives (12.4, 12.8, 12.9)

Taylor series for multivariable functions (12.15)

Implicit differentiation (12.7)

Extrema of multivariable functions and optimization (12.10, 12.11, 12.12, 12.13)

3. **Multiple Integrals** (Trim, Ch. 13)

Double Integrals and Applications (13.1-5)

Triple Integrals and Applications (13.8-10)

Change of Variables (13.7, 13.11-13)

4. **Vector Calculus** (Trim, Ch. 14)

Vector fields, divergence and curl (14.1)

Line integrals and applications (14.2-5)

Green's Theorem (14.6)

Surface Integrals (14.7-8)

Divergence Theorem (14.9)

Stokes' Theorem (14.10)

Fundamental Applications: Flux and Circulation (14.11)

Every course outline must contain the following text, as mandated by the University Senate.

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.

[Check www.uwaterloo.ca/academicintegrity/ for more information.]

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>. When in doubt please be certain to contact the department's administrative assistant who will provide further assistance.

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. 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>.

For typical penalties check Guidelines for the Assessment of Penalties,

<http://www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm>.

Appeals: A decision made or penalty imposed under Policy 70, Student Petitions and Grievances (other than a petition) or Policy 71, Student Discipline may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72, Student Appeals, <http://www.adm.uwaterloo.ca/infosec/Policies/policy72.htm>.

Note for students with disabilities: The Office for Persons with Disabilities (OPD), 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 OPD at the beginning of each academic term.