

Mathematics 202: Calculus III
Spring 2006

Instructor: John Rhodes

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Office Hours: M 9–10, W 2–3, F 10–11, and by appointment

Web page: <http://www.dms.uaf.edu/~jrhodes/M202.html>

Prerequisites: Math 201

Credit Hours: 4.0

Texts: Calculus (early transcendentals), 5th ed., by J. Stewart, Brooks/Cole

Class Meetings: M W R F 8–9, in Gruening 409

In-class Exams: (Tentative) Wednesday, February 15; Monday, April 3

Final Exam: 10:15-12:15, Tuesday, May 9

Course overview and goals:

Though you have must have completed a year of college-level calculus to be in this course, you've only seen the subject used in very special circumstances. For instance, you have dealt with derivatives and integrals only of functions of one variable.

In the real world, most things do not depend on just one variable. For instance, the temperature at any point in space might depend on the 3 variables giving the coordinates of the point. Moving from point to point in any of the x -, y -, or z -directions may produce a change in temperature. For a situation such as this, what do we mean by a derivative?, an integral?

In a slightly different direction, consider a planet orbiting the sun. While the planet's position is a function of time, it really has three components (the x -, y -, and z - coordinates), so we need three functions of the sort you are used to in order to talk about 'the' position function. What should a derivative mean for this sort of three-fold function, and how might it occur in an integral?

Our goal for the semester is to extend your knowledge of calculus into the two- and three-dimensional settings that naturally occur in many situations in the sciences. You will use heavily all the material from Math 200 and 201, as we will ultimately see all the calculational rules for derivatives and integrals learned there can be used in this new multidimensional setting. However, you will learn new conceptual frameworks that enable you to apply these known rules.

This material is essential for further study in mathematics, the physical sciences, and engineering. It also appears often in some branches of economics and the biological sciences as well.

Finally, be warned that understanding two and three dimensions mathematically is harder for many students than they might at first expect. You will have to think hard about the material. It is challenging, but also very rewarding.

Mechanics of the course:

Class meetings will be run as interactive lectures, to the extent possible given the enrollment. That means that while I will be presenting material at the board, and you will be taking notes, I will also be asking for suggestions, ideas, and questions about the material as we go along. I don't expect 'correct' answers, but I do expect you to be actively following and participating — that makes the class more interesting for us all.

Class attendance is expected, although I will not formally take roll. If you miss a class, you should get notes from another student. Homework assignments will be given in class, but also posted on the course web page soon after class is over.

Quizzes will be given randomly throughout the semester, roughly once per week. These will typically take 10-15 minutes and be similar to recent homework. These serve two primary purposes 1) to encourage you to be present in every class and 2) to ensure that you stay current with the homework. If you expect to miss a class, you should talk to me in advance about having any potential quiz waived — you must have a good reason and (except in situations I consider to be emergencies) you cannot get retroactive approval.

Homework will usually be assigned daily, and collected each Monday. I will typically begin each class by asking if there are questions about the last lecture and its homework assignment. That means you should review notes and make at least an initial attempt on homework problems before the next class meeting, even though problems may not be collected until several days later. While it never hurts to ask, in general I will defer questions about any earlier assignment to my office hours, in order to keep the course moving along.

I encourage you to work with others on the homework, but you must *write up solutions independently*. You will learn nothing from simply copying someone's solution. Even though you may find you can't do every problem, you must make a reasonable attempt on them all. The entire homework assignment will be checked to be sure you have attempted everything. Selected problems may be graded more completely.

Homework will be accepted until 5pm on its due date, either at my office or in my mailbox in the math department office. I will not accept *any* late homework that has not been cleared ahead of time or is not due to a genuine emergency (e.g., a death in the family).

Missed examinations that are not approved in advance will result in an 'F' on that exam. No make-up exams will be given except in extreme circumstances (e.g., family death, documented illness, etc.). Notifying me by email or a note

that you will miss an exam is not sufficient for advance approval; you must speak with me to be excused.

Tutoring is available at no cost, on a walk-in basis, at the Math Lab in Chapman 305. Hours will be announced, and posted on the door. A good way to use the Math Lab is to simply go there to do your homework, so that if any questions come up you can get immediate help.

Calculators will not be allowed on any examinations or quizzes. This will ensure that testing conditions are equal for everyone. I have no strong feelings on whether you use a calculator when doing homework. As long as you are sure you have the skills to do all calculations by hand, it is fine for you to use technology as a time saver.

Auditing of this course will only be allowed for those who agree to attend regularly, as evidenced by completion of midterm exams and most quizzes.

Grades:

Your performance will be evaluated based on 10% quizzes, 5% homework, 25% first midterm exam, 25% second midterm exam, 35% final exam.

Course grades will be determined according to the following cutoffs:

$$A \geq 90\%,$$

$$B \geq 80\%,$$

$$C \geq 70\%,$$

$$D \geq 60\%.$$

I reserve the right to move the cutoff points downward if particular exams turn out to be unexpectedly difficult. Note that you are not in competition with your peers – everyone in the class may get an *A*, or everyone may get an *F*.

University and Department Policies:

Your work in this course is governed by the UAF Honor Code. The Department of Mathematics and Statistics has specific policies on incompletes, late withdrawals, and early final exams which can be found at

<http://www.dms.uaf.edu/dms/Policies.html>.

If you have any disabilities that I should know about, you should bring them to my attention soon so that we can work with the Office of Disability Services to set up any necessary accommodations.

Tentative Schedule

Week 1	Jan. 19 – Jan. 20	Chapter 12: two- and three-dimensional space, vectors
Week 2	Jan. 23 – Jan. 27	Chapter 12: Dot products, cross products, lines and planes
Week 3	Jan. 30 – Feb. 3	Chapter 12: Quadric surfaces; polar, cylindrical, and spherical coordinates,
Week 4	Feb. 6 – Feb. 10	Chapter 13: Vector-valued functions Chapter 13: Derivative and integrals of vector functions, curves and arc length, velocity and acceleration
Week 5	Feb. 13 – Feb. 17	EXAM 1 Wednesday (Chapters 12 and 13) Chapter 14: Functions of several variables, limits and continuity;
Week 6	Feb. 20 – Feb. 24	Chapter 14: partial derivatives, linear approximations and tangent planes, the chain rule
Week 7	Feb. 27 – Mar. 3	Chapter 14: Gradients and directional derivatives, optimization, Lagrange multipliers
Week 8	Mar. 6 – Mar. 10	Chapter 15: Integrals over 2-d regions, iterated integrals, integrals in polar coordinates
BREAK	Mar. 13 – Mar. 17	
Week 9	Mar. 20 – Mar. 24	Chapter 15: Applications of double integrals, surface area
Week 10	Mar. 27 – Mar. 31	Chapter 15: Integrals over 3-d regions, integrals in cylindrical and spherical coordinates
Week 11	Apr. 3 – Apr. 7	EXAM 2 Monday (Chapters 14 and 15); Chapter 16: vector fields, line integrals
Week 12	Apr. 10 – Apr. 14	Chapter 16: Fundamental Theorem for line integrals, conservative fields, path independence
Week 13	Apr. 17 – Apr. 21	Chapter 16: Green's Theorem, curl, divergence
Week 14	Apr. 24 – Apr. 27	Chapter 16: Parameterized surfaces, surface integrals, flux, <i>SpringFest</i>
Week 15	May 1 – May 5	Chapter 16: Stokes' Theorem and the Divergence theorem (if time permits), final review