Mathematics 211 — Fall, 2012

Instructor: Michael Rogers
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Hours: MTuTh 3:00–5:00; W 6:30PM–8:00PM

	8:00	9:00	10:00	11:00	12:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00
Mon								office hours				
Tue								office hours				
Wed												office hours
Thu								office hours				
Fri												

Availability for appointments:

always	sometimes	never

Course Content: Mathematics 211 is the third semester of calculus. It revisits and adapts the concepts from first-year calculus in the setting of three-dimensional space. The main topics are geometry in space; vectors; functions of more than one variable including vector fields; the limits, differentiation, and integration of such functions; and applications.

Textbook and software: Marsden and Tromba, *Vector Calculus*, 6th ed., Prentice-Hall.
Mathematica for Students (http://www.wolfram.com/products/student/mathforstudents/licenses.html)

A free screencast, Hands-On Start (http://www.wolfram.com/broadcast/screencasts/handsonstart/), teaches basic commands of *Mathematica*. Other tutorials are found at .

Course Goals: After this course, you should be able to do the following: to sketch three-dimensional graphs, to understand how the calculus of single-variable functions generalizes to multivariable functions, to evaluate limits of multivariable functions, to differentiate multivariable functions and vector fields, to integrate multivariable functions and vector fields, to discuss the roles of these processes of multivariable calculus in solving problems, to understand better the material of first-year calculus.

Classes: You are responsible for work covered in class. Furthermore you are expected to have done the reading for each class. Your ability to get the most out of each class is greatly diminished by a failure to be prepared.

Evaluation: Grades will be based on the following written work:

Tests (3 @ 100 pts)	300 points
Problem sets (100, 150, 220 pts)	470 points
Quizzes (9 @ 20 pts)	180 points
Graphing portfolio	50 points
Total	1000 points

The plus/minus system will be used. A rough guide to grades: A: $\geq$ 900 pts. B: 800–900 pts. C: 700–800 pts. D: 600–700 pts. F: $<$ 600 pts.

Tests: There are three in-class, closed-book, timed tests, each worth 100 points.

Problem Sets: There are two midterm problems sets and a final problem set. The problem sets are take-home and open-book, but they are to be worked on one's own. A midterm problem set will be handed out before each of the first two tests and due after it; at least a week will be allowed. During that time, the student is expected to keep up with the regular class work. The final problem set takes the place of a final examination. The problem sets are cumulative, increase in value, and are worth 100, 150, and 220 points respectively.

Quizzes: All quizzes are announced and take-home. The student must be present in class to receive her or his quiz. Each quiz must be worked at *one sitting* and use only *authorized materials.* In general neither books nor notes will be allowed. Quizzes are due by the next class meeting. Each quiz is worth 20 points. In total there will be 12 quizzes of which 9 will be counted. In each of the three testing units, one quiz will be dropped.

Graphing Project: Due Friday, November 23. Each student is to prepare a portfolio of at least 2 three-dimensional images created with *Mathematica*. The portfolio should exhibit all the types of graphs encountered in the course: Cartesian coordinates ($z = f(x,y)$), polar/cylindrical coordinates ($z = f(r,\theta)$), spherical coordinates ($\rho = f(\theta,\phi)$), parametrized curves ($(x,y,z) = \mathbf{r}(t)$), and parametrized surfaces ($(x,y,z) = \Phi(u,v)$). The portfolio will be worth 50 points.

There is a screencast that may be helpful:
(http://www.wolfram.com/broadcast/screencasts/abbybrown/3D_Graphing/)
There is a *Mathematica* notebook that contains an interface to make producing graphs easier. It is called "Graphing Project — Interface" on Blackboard (https://classes.emory.edu).

Homework: Exercises are assigned almost every day of class. These exercises usually will not be collected but are for the benefit of the student. Solving problems and practicing their solution is only good way to learn mathematics. Students may ask questions about the homework, and quizzes based on the homework may be given. The instructor may ask to see a student's homework.

Although the homework exercises are not graded, it is important for the success of the student that they be completed as soon after covering the material as possible. Calculators ought to be used when appropriate, but the student should keep in mind that they are not permitted on the tests. Collaboration is encouraged, but each student should be sure that he or she ultimately can **solve problems unaided by notes, the textbook, a calculator, or other people**. Use good style on your homework. In general you need to spend at least 6-8 good hours per week on study not counting the time spent taking quizzes and reviewing for tests.

Excuses: Excuses deemed legitimate by the instructor will be handled according to the individual circumstances and college policies.

The student is expected to take all tests and exams at the scheduled times. For legitimate excuses arrangements will be made to take a test **prior to** the testing time. Any student who needs special accommodations must provide documentation of the needed accommodation and make appropriate arrangements with the instructor several days in advance. There will be no make-up tests given after the testing time.

Written style: Thoughts are expressed by sentences: just so in mathematics. Pay attention to your textbook: it is written in sentences. **Your written work must be in complete sentences.** Note "$1 + 1 = 2$" is a complete sentence (it has a subject "$1 + 1$", verb "$=$" and predicate "2"). Use mathematical symbols wherever appropriate. Your work also needs to be neat and orderly to be intelligible. See the essay, "Clean Writing in Mathematics," from *Calculus: A Liberal Art,* by W.M. Priestley and the "Calculus Style Guide." Practice good style in all your work, including uncollected homework.

All questions answered: On the last day I will answer questions about anything except religion, politics, and the last test/problem set. Attendance is optional.

Honor Code: The Honor Code of Oxford College applies to all work submitted for credit in this course. To receive credit for work submitted you must place your name on it. By placing your name on such work, you pledge that the work has been done in accordance with the given instructions and that you have witnessed no Honor Code violations in the conduct of the assignment.

Tentative Calendar: The calendar of topics below is subject to change. The expansion of contact hours presents several alternatives for using class time. The topics will not change, but the dates and class actvities may be adjusted to take advantage of class time.

Date	Topic	Section
Wed 29 Aug	Vectors in Two- and Three-Dimensional Space	1.1
Fri 31 Aug	The Inner Product, Length, and Distance	1.2
Mon 3 Sep	*Labor Day*	
Tue 4 Sep	Matrices, Determinants, and the Cross Product	1.3
Wed 5 Sep	Vector geometry problems	
	Quiz 1A	
Fri 7 Sep	Cylindrical and Spherical Coordinates	1.4
Mon 10 Sep	n-Dimensional Euclidean Space	1.5
Tue 11 Sep	n-Dimensional Euclidean Space	1.5
Wed 12 Sep	The Geometry of Real-Valued Functions	2.1
	Quiz 1B	
Fri 14 Sep	Limits and Continuity	2.2
Mon 17 Sep	Limits and Continuity	2.2
Tue 18 Sep	Limits and Continuity	2.2
Wed 19 Sep	Differentiation	2.3
	Quiz 1C	
Fri 21 Sep	Differentiation	2.3
	Quiz 1D	
Mon 24 Sep	Applications	
Tue 25 Sep	**Test 1**	
Wed 26 Sep	Introduction to Paths and Curves	2.4
Fri 28 Sep	Properties of the Derivative	2.5
Mon 1 Oct	Properties of the Derivative	2.5
Tue 2 Oct	Gradients and Directional Derivatives	2.6
Wed 3 Oct	Iterated Partial Derivatives	3.1
	Quiz 2A	
Fri 5 Oct	Review of derivatives	
Mon 8 Oct	*Fall Break*	
Tue 9 Oct	*Fall Break*	
Wed 10 Oct	Taylor's Theorem	3.2
	Quiz 2B	
Fri 12 Oct	Extrema of Real-Valued Functions	3.3
Mon 15 Oct	Constrained Extrema and Lagrange Multipliers	3.4
Tue 16 Oct	The Implicit Function Theorem	3.5
Wed 17 Oct	Acceleration and Newton's Second Law	4.1
	Quiz 2C	
Fri 19 Oct	Arc Length	4.2
Mon 22 Oct	Vector Fields	4.3

Tue 23 Oct	Divergence and Curl	4.4
Wed 24 Oct	Applications	
	Quiz 2D	
Fri 26 Oct	Integration	5.1
Mon 29 Oct	Integration	5.1
Tue 30 Oct	**Test 2**	
Wed 31 Oct	The Double Integral Over a Rectangle	5.2
Fri 2 Nov	The Double Integral Over More General Regions	5.3
Mon 5 Nov	Changing the Order of Integration	5.4
Tue 6 Nov	The Triple Integral	5.5
Wed 7 Nov	The Geometry of Maps from $\mathbb{R}^2$ to $\mathbb{R}^2$	6.1
	Quiz 3A	
Fri 9 Nov	The Change of Variables Theorem	6.2
Mon 12 Nov	Applications	6.3
Tue 13 Nov	The Path Integral	7.1
Wed 14 Nov	Line Integral	7.2
	Quiz 3B	
Fri 16 Nov	Parametrized Surfaces	7.3
Mon 19 Nov	Area of a Surface	7.4
Tue 20 Nov	Integrals of Scalar Functions Over Surfaces	7.5
Wed 21 Nov	*Thanksgiving break*	
Fri 23 Nov	*Thanksgiving break*	
Mon 26 Nov	Surface Integrals of Vector Fields	7.6
Tue 27 Nov	Applications	7.7
Wed 28 Nov	Green's Theorem	8.1
	Quiz 3C	
Fri 30 Nov	Stokes' Theorem	8.2
Mon 3 Dec	Conservative Fields	8.3
Tue 4 Dec	Gauss' Theorem	8.4
Wed 5 Dec	Applications	
	Quiz 3D	
Fri 7 Dec	Applications	
Mon 10 Dec	**Test 3**	
Tue 11 Dec	All questions answered	