Mathematics 211
Fall, 2018

Instructor: Dr. Michael Rogers.

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:

- Colley, *Vector Calculus,* 4^{th} ed., Prentice-Hall.
- *Mathematica* (software), http://it.emory.edu/software/.

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
Quizzes (9 @ 20 pts)	180 points
Graphing portfolio	100 points
Final esxamination	220 points
Total	800 points

The plus/minus system will be used. A rough guide to grades: A: $\geq$ 700 pts. B: 600–700 pts. C: 500–600 pts. D: 400–500 pts. F: $<$ 600 pts.

Tests: There are three, closed-book, timed tests, some out-of-class, each worth 100 points. Dates:

Test 1: Thu 27 Sep, 8:00 – 9:30 a.m.
Test 2: Thu 1 Nov, 8:00 – 9:30 a.m.
Text 3: Mon 10 Dec (in class)

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 Portfolio: Due Tuesday, November 20. 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.Specific requirements will be given in the assignment. The portfolio will be worth 100 points.

Homework: Assignments from the text will be given as we cover each topic; these assignments will not be collected. **The purpose of calculation is insight** (Hamming). In general a good student will need to spend at least six good hours per week on homework.

It is the instructor's opinion that this course is about as hard as first year calculus with this important qualification: If you enrolled in a college-level calculus course with no previous calculus experience, then this course will require about as much work. If you "coasted" through calculus, this course will be different. Almost no one will have any familiarity with the new concepts in this course, except in as much as they resemble those from single variable calculus.

A routine exercise in multivariable calculus tends to take more time than one in single-variable calculus. Therefore it will not be possible to practice with the same level of repetition as in Math 111/112. Instead, the student must probe each exercise deeply. Take time to reflect on each problem as you complete it.

Use Good Style: Thoughts are expressed by sentences: just so in mathematics. **Written work must be in complete sentences.** The same applies to daily homework. See Priestley, "Clean Writing in Mathematics," pp. 413–420 in *Calculus: An Historical Approach*, available through Canvas.

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.

Proposed Calendar

Date	Topic	Section
Wed 29 Aug	Vectors, Calculus, and Analysis	§1.1
Fri 31 Aug	Vectors	§1.2
Mon 3 Sep	*Labor Day — No class.*	
Wed 5 Sep	Dot product	§1.3
Fri 7 Sep	Cross product	§1.4
	Quiz 1A	
Mon 10 Sep	Planes, distance	§1.5
Wed 12 Sep	n-dimensional geometry	§1.6
	Quiz 1B	
Fri 14 Sep	Coordinates	§1.7
Mon 17 Sep	Review of matrices and coordinates	§1.6, §1.7
Wed 19 Sep	Functions of several variables	§2.1
	Quiz 1C	
Fri 21 Sep	Limits	§2.2
Mon 24 Sep	Limits	§2.2
	Quiz 1D	
Wed 26 Sep	Limits	§2.2
Fri 28 Sep	The derivative	§2.3
Mon 1 Oct	The derivative	§2.3
Wed 3 Oct	Derivatives	§2.4
	Quiz 2A	
Fri 5 Oct	Chain Rule	§2.5
Mon 8 Oct	*Fall Break — No class.*	
Wed 10 Oct	Chain Rule	§2.5
Fri 12 Oct	Directional derivatives, the gradient	§2.6

Mon 15 Oct	Parametrized curves	§3.1
	Quiz 2B	
Wed 17 Oct	Arc length and differential geometry	§3.2
Fri 19 Oct	Vector fields	§3.3
Mon 22 Oct	Gradient, divergence, and curl	§3.4
	Quiz 2C	
Wed 24 Oct	Taylor's theorem	§4.1
Fri 26 Oct	Extrema	§4.2
	Quiz 2D	
Mon 29 Oct	Lagrange multipliers	§4.3
Wed 31 Oct	Applications	§.4.4
Fri 2 Nov	Integration	§5.1
Mon 5 Nov	Double integrals	§5.2
Wed 7 Nov	Changing the order of integration	§5.3
	Quiz 3A	
Fri 9 Nov	Triple integrals	§5.4
Mon 12 Nov	Change of variables (substitution)	§5.5
Wed 14 Nov	Applications	§5.6
	Quiz 3B	
Fri 16 Nov	Line and path integrals	§6.1
Mon 19 Nov	Green's theorem	§6.2
Wed 21 Nov	*Thankgiving — No class.*	
Fri 23 Nov		
Mon 26 Nov	Conservative vector fields	§6.3
Wed 28 Nov	Parametrized surfaces	§7.1
	Quiz 3C	
Fri 30 Nov	Surface integrals	§7.2
Mon 3 Dec	Stokes's theorem	§7.3
	Quiz 3D	
Wed 5 Dec	Gauss's theorem	§7.3
Fri 7 Dec	Vector analysis	§7.4
Mon 10 Dec	Test 3	