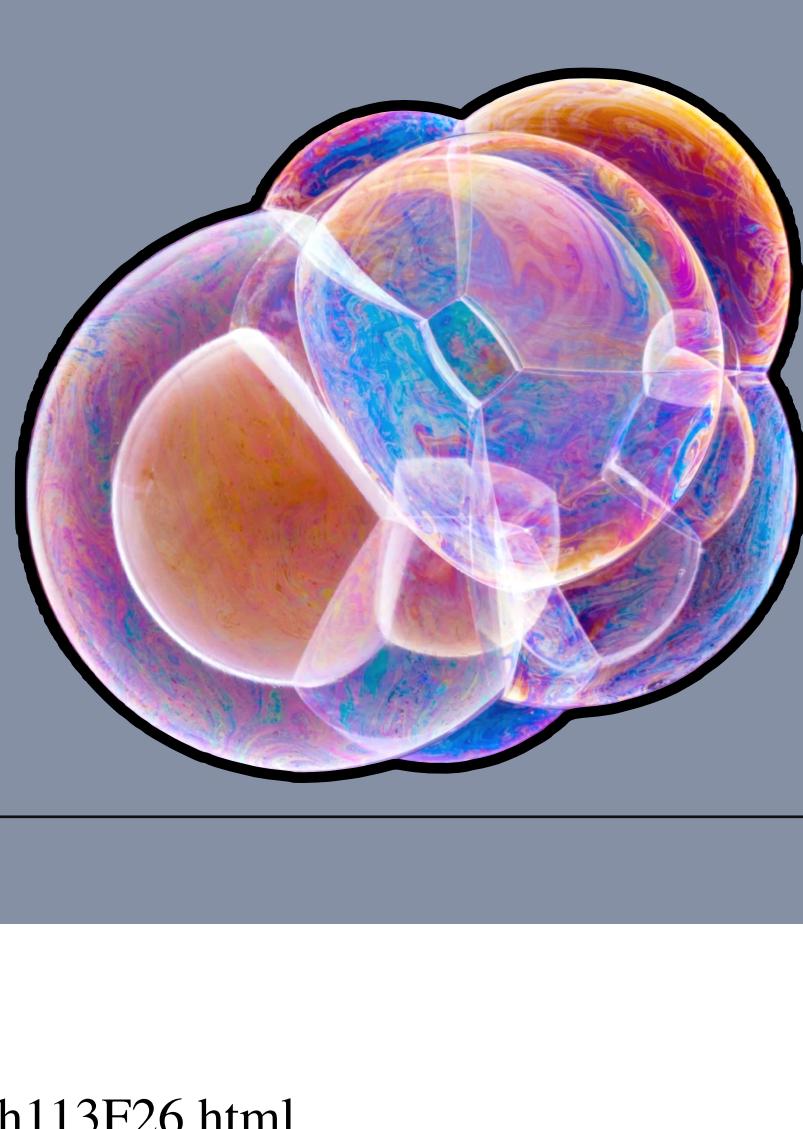


Multivariable Calculus



MTH 113

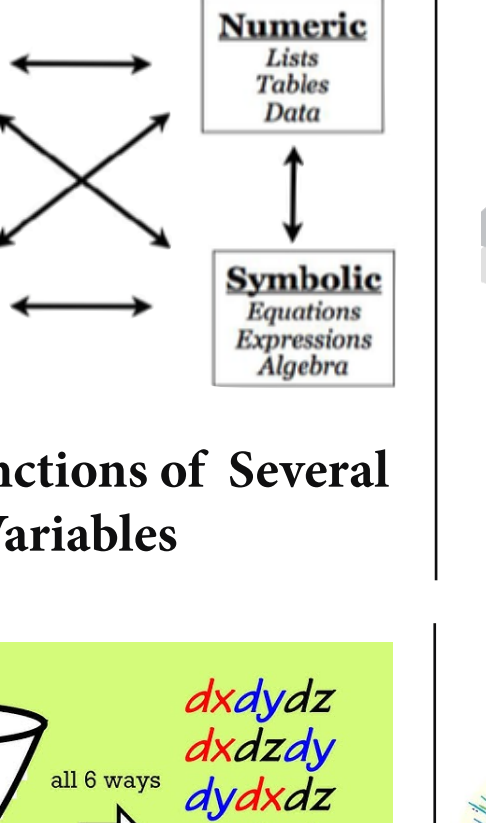
Dr. John Gemmer: gemmerj@wfu.edu
Office: Manchester 388
Course Website: <http://users.wfu.edu/gemmerj/math113F26.html>
Canvas: The course syllabus and grades will be posted on Canvas as well as announcements
Office Hours: T 10:00-10:50, W 12:00-2:00, Th 1:00-3:00
Class Meeting Times: MTWF 9:00-9:50
Class Location: Kirby-Manchester 229

COURSE DESCRIPTION

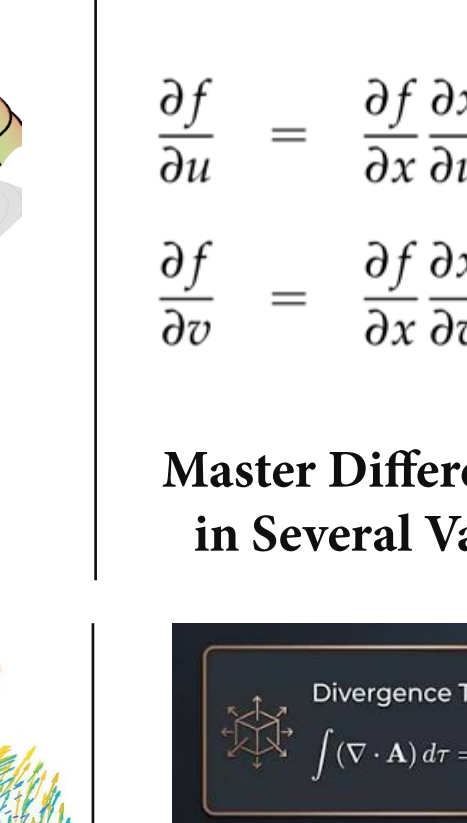
Multivariable Calculus extends the ideas of differential and integral calculus to functions of several variables, opening the door to many of the mathematical tools used throughout the sciences, engineering, economics, and data science. In this course, we will explore the geometry of three-dimensional space, vector-valued functions and space curves, partial derivatives, gradients, optimization, multiple integrals, vector fields, and line and surface integrals. The semester culminates with Green's Theorem, Stokes' Theorem, and the Divergence Theorem—three elegant results that unify differentiation, integration, and geometry in surprising and powerful ways.

Throughout the course, emphasis will be placed on developing both computational proficiency and a deep conceptual understanding of multivariable calculus. Students will strengthen their geometric intuition, learn to solve challenging real-world problems, and discover how the ideas of calculus extend naturally to higher dimensions. Successful completion of this course provides a strong foundation for advanced study in mathematics, applied mathematics, physics, engineering, economics, and many other STEM disciplines.

REQUIREMENTS



Prerequisites: MTH 111 and MTH 112 (Calculus I and II)



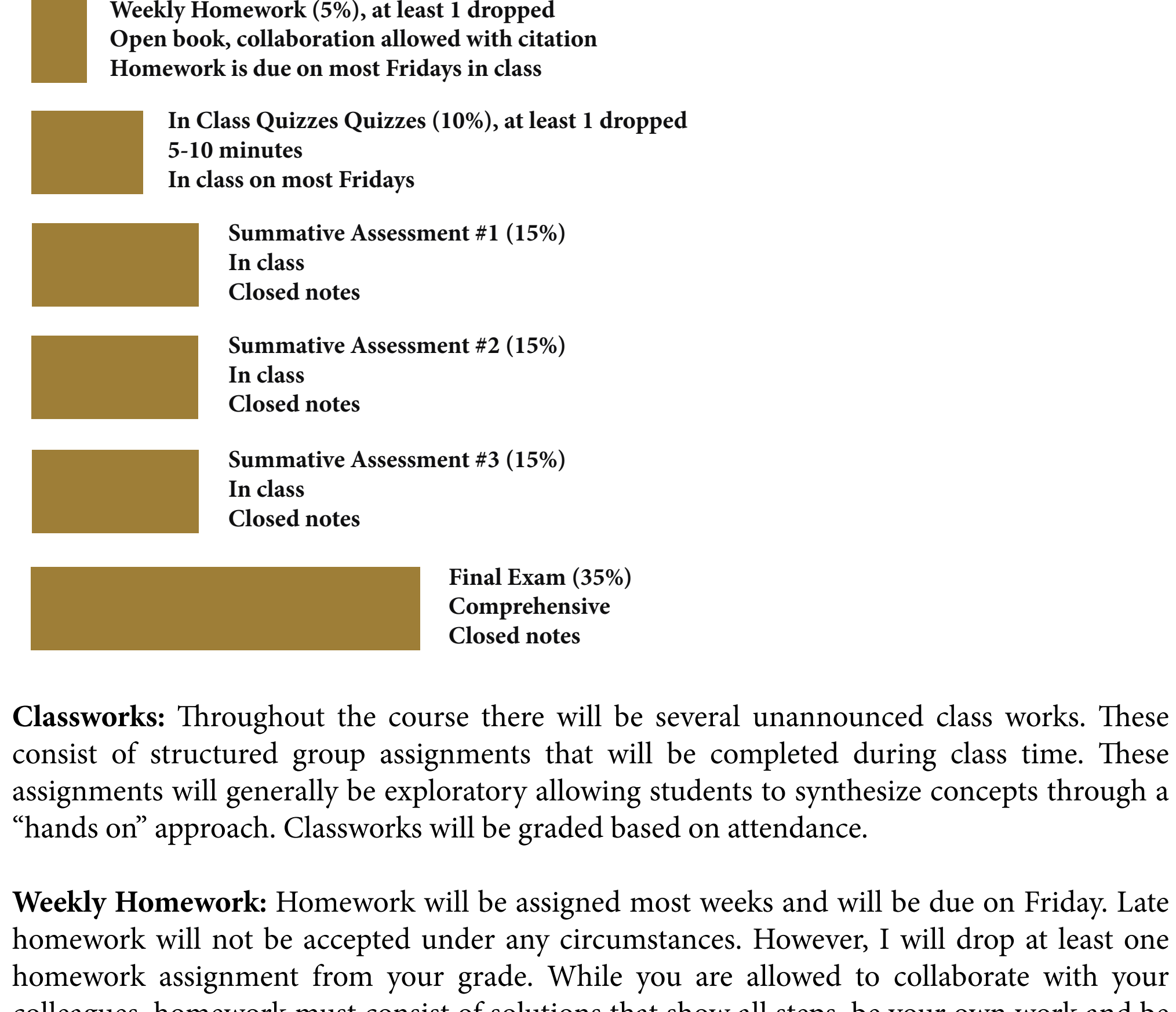
Textbook: Stewart, J., Clegg, D. K., & Watson, S. (2020). *Multivariable calculus*. Cengage Learning.

OBJECTIVES

Master Functions of Several Variables	Develop Geometric Intuition	$\frac{\partial f}{\partial u} = \frac{\partial f}{\partial x} \frac{\partial x}{\partial u} + \frac{\partial f}{\partial y} \frac{\partial y}{\partial u}$ $\frac{\partial f}{\partial v} = \frac{\partial f}{\partial x} \frac{\partial x}{\partial v} + \frac{\partial f}{\partial y} \frac{\partial y}{\partial v}$ Master Differentiation in Several Variables
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Master Integration in Several Variables	Master Vector Fields and Their Applications	Understand the Fundamental Theorems of Vector Calculus
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CLASS STRUCTURE



EVALUATION

We focus on learning and mastery. You are guaranteed the following grades if your final percentage lies within the following ranges:

90-92.9: A-	93-100: A	
80-82.9: B-	83-86.9: B	87-89.9: B+
70-72.9: C-	73-76.9: C	77-79.9: C+
60-62.9: D-	63-66.9: D	67-69.9: D+

- Classworks (5%)**
Structured in class group assignments
Grades based on attendance
- Weekly Homework (5%), at least 1 dropped**
Open book, collaboration allowed with citation
Homework is due on most Fridays in class
- In Class Quizzes Quizzes (10%), at least 1 dropped**
5-10 minutes
In class on most Fridays
- Summative Assessment #1 (15%)**
In class
Closed notes
- Summative Assessment #2 (15%)**
In class
Closed notes
- Summative Assessment #3 (15%)**
In class
Closed notes
- Final Exam (35%)**
Comprehensive
Closed notes

Classworks: Throughout the course there will be several unannounced class works. These consist of structured group assignments that will be completed during class time. These assignments will generally be exploratory allowing students to synthesize concepts through a “hands on” approach. Classworks will be graded based on attendance.

Weekly Homework: Homework will be assigned most weeks and will be due on Friday. Late homework will not be accepted under any circumstances. However, I will drop at least one homework assignment from your grade. While you are allowed to collaborate with your colleagues, homework must consist of solutions that show all steps, be your own work and be written clearly using complete sentences as appropriate. All homework will be submitted in class on paper. I will not accept digital versions of your homework.

In Class Quizzes: On most Fridays there will be a short 5-10 minute in-class quizzes. These quizzes will consist of a very short problem that will test your knowledge of the prior lectures and homework. These quizzes are to help both the students and the instructor understand concepts that students may be struggling with. All quizzes will be announced in class. There will be no “pop” quizzes. There are no retakes for missed quizzes, however I will drop the lowest quiz score from your final grade.

Summative Assessments: There will be three in class summative assessments in the course and a cumulative final exam. The final exam will be schedule as part of the “Math Block” on **December 9 at 9:00 AM**. The exact location will be announced in class in late November or early December and posted on Canvas and the course website.

Late Work Policy: Except in very extreme circumstances, I do not accept late assignments or reschedule exams. If you have a situation in which you cannot make an exam for personal reasons, you must arrange accommodations with the instructor to schedule the exam **before the scheduled exam date**. If you have a legitimate emergency situation, I will make sure that all students in the course will have access to the same exception to this policy.

If you need to miss class due to a university sponsored activity, such as athletics. Please contact the faculty member as soon as possible to reschedule due dates.

COURSE ENVIRONMENT

Names/Pronouns
You **deserve** to be addressed in the manner you prefer. To guarantee that I address you properly, you are welcome to tell me your pronoun(s) and/or preferred name at any time, either in person or via email.

Diversity
We embrace diversity of age, background, beliefs, ethnicity, gender, gender identity, gender expression, national origin, religious affiliation, sexual orientation, and other visible and non-visible categories. **I do not tolerate discrimination.**

Accessibility
I want you to succeed in this course. Wake Forest University provides reasonable accommodations to students with disabilities. If you are in need of an accommodation, then please contact me privately as early in the term as possible. Retroactive accommodations may not be provided. Students requiring accommodations must also consult the Center for Learning, Access, and Student Success(118 Reynolda Hall, 336-758-5929, <http://class.wfu.edu>). For personal issues, stress, health problems or life circumstances see shs.wfu.edu/. Contact me if you have other special circumstances. **I will find resources for you.**

Title IX
You **deserve** a community free from discrimination, sexual harassment, a hostile environment, sexual assault, domestic violence, dating violence, and stalking. If you experience or know of a Title IX violation, you have many options for support and/or reporting; see titleix.wfu.edu/.

Emergency Fund
You **deserve** a learning environment in which all of your physiological and safety needs are met. If you are experiencing situations in which these needs are not met, e.g. you do not have adequate housing or sufficient food security, the Chaplain's Office has an emergency fund which can provide support: <https://chaplain.wfu.edu/care-support/chaplains-emergency-fund/>. In situations in which you need immediate assistance there is emergency funding available through the Department of Mathematics and Statistics. If you are in need of emergency help you are encouraged to reach out to a faculty member in the Department of Mathematics and Statistics who will work with the chair of the department to address your needs.

Course Resources
The department has a limited amount of funding for class materials. If you cannot afford class materials, you are encouraged to contact the chair of the department privately as early in the term as possible. Due to the limited amount of funds, students must exhaust all other sources of funding before applying to the department for assistance.

The Honor Code
At Wake Forest, we expect you to behave as honorable citizens of the class, the university, and the world as a whole. When you complete an assignment with your name on it, you are representing that everything you are turning in is your own work. That means that you do not copy from other students, textbooks, or websites. If at any time I become aware of cheating or plagiarism in this course, I will submit the information to the honor council.

Tentative Calendar and Important Dates

Some Geometry in Higher Dimensions		
Week 1 (8/24-8/28): Introductions, Going Over the Syllabus, Parametric Curves (Sections 10.1-10.2) 1. 8/28: Homework #1 Due.		
Week 2 (8/31-9/4): Polar Coordinates and Three Dimensional Space (Sections 10.3-10.4, 12.1) 1. 9/4: Homework #2 Due, Quiz #1.		
Week 3 (9/7-9/11): Vectors (Sections 12.2-12.4) 1. 9/7: Labor Day (No Class) 2. 9/11: Homework #3 Due, Quiz #2.		
Week 4 (9/14-9/18): Lines, Planes, and Quadratic Surfaces (Sections 12.5-12.6) 1. 9/18: Exam #1		
Differential Calculus in Higher Dimensions		
Week 5 (9/21-9/25): Differential Calculus in Several Variables Part I (Sections 14.1-14.3) 1. 9/25: Homework #4 Due, Quiz #3		
Week 6 (9/28-10/2): Differential Calculus in Several Variables Part II (Sections 14.4-14.6) 1. 10/2: Homework #5 Due, Quiz #4		
Week 7 (10/5-10/9): Optimization (Sections 14.7-14.8) 1. 10/9: Homework #6 Due, Quiz #5		
Week 8 (10/12-10/16): Double Integrals in Cartesian Coordinates (Sections 15.1-15.2) 1. 10/12: Fall Break (No Class) 2. 10/13: Fall Break (No Class) 3. 10/16: Exam #2		
Multiple Integrals in Higher Dimensions		
Week 9 (10/19-10/23): Double Integrals in Polar Coordinates and Surface Area (Sections 15.3, 15.5) 1. 10/23: Homework #7 Due, Quiz #6		
Week 10 (10/26-10/30): Triple Integrals Part I (Sections 15.6-15.7) 1. 10/23: Homework #8 Due, Quiz #7		
Week 11 (11/2-11/6): Triple Integrals Part II (Sections 15.8-15.9) 1. 11/6: Homework #9 Due, Quiz #8		
Week 12 (11/9-11/13): Vector Fields and Line Integrals (Sections 16.1-16.2) 1. 11/13: Exam #3		
Vector Calculus		
Week 13 (11/16-11/20): Conservative Fields and Vector Derivatives, (Sections 16.3, 16.5) 1. 11/20: Homework #10 Due, Quiz #9		
Week 14 (11/23-11/27): Green's Theorem (Section 16.4) 1. 11/25: Thanksgiving Break 2. 11/26: Thanksgiving Break 3. 11/27: Thanksgiving Break		
Week 15 (11/30-12/4): Green's Theorem and Divergence Theorem (Sections 16.3, 16.9) 1. 12/5: Homework #11 Due, Quiz #10		
Week 16 (12/7): Catch up Day		
Final Exam: December 9, 9:00 AM		

SUCCESS

Attend class	Participate constantly	Invest time
Concentrate on concepts in addition to calculations	Seek help when needed	Eliminate Virtual Distractions