MONTGOMERY COLLEGE - Germantown Campus
Mathematics & Statistics Department
Course Syllabus

I. Instructor Information

Professor: Zhou Dong
Email: Zhou.Dong@MontgomeryCollege.edu
Phone: (240) 567-7810
[1]Office: HT 134
[1]Mail box: HT 314
Office Hours:

Monday	Tuesday	Wednesday	Thursday	Friday
9:30 am – 10:00 am	9:30 am – 10:00 am	11:30 am – 12:30 pm	9:30 am – 10:00 am	9:30 am – 10:00 am

Learning Assistant: Linh Hoang
Email: ahoang16@montgomerycollege.edu
Office Hours: Friday 11:30 am – 12:30 pm

II. General Course Information

Calculus I – MATH181

4 credits / 5 hours (For computation of tuition, this course is equivalent to five semester hours. Five hours each week.)

Intended primarily for students of the physical sciences, engineering, and mathematics. An introduction to major ideas of single variable calculus including limits, derivatives, and integrals of algebraic and transcendental functions; applications.

MATH181 fulfills a General Education Program Mathematics Foundation requirement.

PREREQUISITE:
A grade of C or better in MATH 165, appropriate score on mathematics assessment test, or consent of department. Assessment levels: ENGL 101/101A or AELW 940, READ 120 or AELR 930.

HONORS ELIGIBILITY:

- SAT score of 600 or above on each section
  OR
- Completion of at least 12 Montgomery College credits with 3.2+ GPA
- Grade of A or B in ENGL 101 or ENGL 101A or Eligible for ENGL 102

[1] Not available during Remote Instruction. Virtual class meetings and office hours held on Microsoft Teams.

Fall 2020: CRN 25767
Class Times: MWF 10:00 am – 11:25 am
[1]Class Room: HT 405

III. Common Course Student Learning Outcomes

Upon course completion, a student will be able to:

- Determine when and how to apply the Fundamental Theorem of Calculus.
- Evaluate limits graphically, algebraically, and numerically.
- Explain and distinguish between average and instantaneous rates of change and be able to interpret each within the context of an applied problem.
- Find a derivative directly from the definition of a derivative.
- Identify and apply the appropriate rule(s) for symbolic differentiation.
- Implicitly differentiate a function.
- Interpret derivatives verbally in the context of an application.
- Interpret limits verbally.
- Interpret the definite integral as a limit of sums.
- Interpret the indefinite integral as an inverse process of differentiation and evaluate indefinite integrals.
- Set up and evaluate definite integrals to solve applied problems, such as problems involving area, motion, and net change.
- Use derivatives to determine the extreme values of a function.
- Use derivatives to model and analyze a variety of applications, such as problems involving optimization, related rates, and motion.
- Use first and second derivatives to obtain information about the graph of a function and use the graph of a function to obtain information about its first and second derivatives.
- Use technology to discover, explore, illustrate, and understand limits, derivatives, and integrals.

IV. Textbooks, Workbooks, and Supplies

Required materials for the course:

- *Single Variable Calculus: Concepts and Contexts* (4th edition), by James Stewart, Brooks-Cole, 2007. (The ebook is available with WebAssign).
- *WebAssign Access Code* – for access to online homework and the ebook
  Class Key to enroll on WebAssign: **montgomerycollege 5355 0205**
- *Graphing calculator* - A TI-83 or TI-83 Plus (http://wabbitemu.org/) or Desmos (www.desmos.com/calculator) is recommended.
- *Microsoft Teams and OneNote* – for course meetings, announcements and communication. **Team code: ca1d4vo**
  MC students can download these programs for free from their Microsoft 365 account: https://info.montgomerycollege.edu/offices/information-technology/services/office_365.html

V. Course Requirements

A. Bloom's Taxonomy

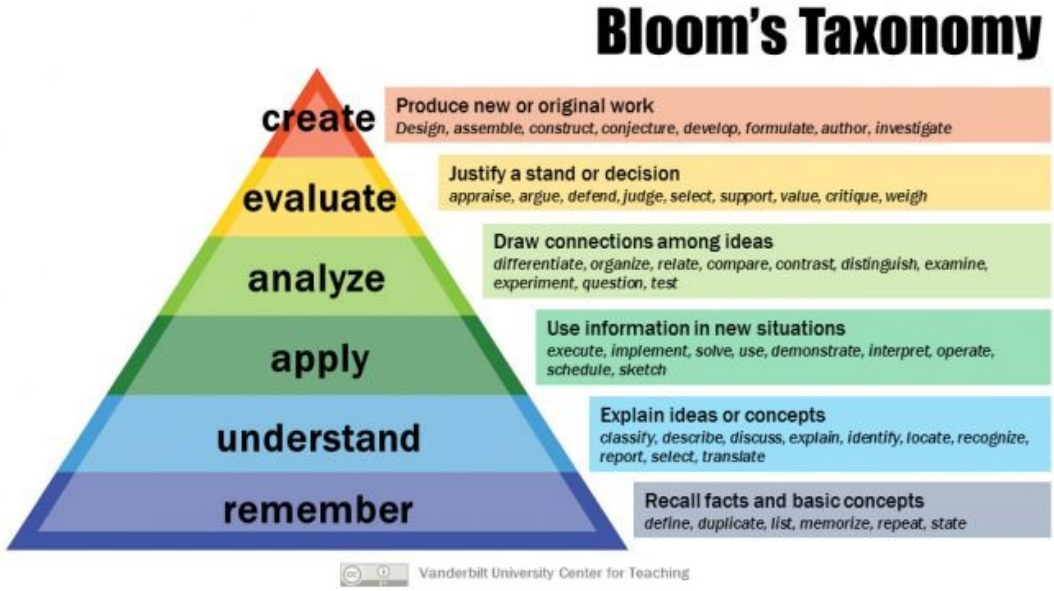

Figure 1 - Bloom's Taxonomy, from https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/

This class has been designed based on Bloom's Taxonomy. A basic understanding of Bloom's Taxonomy will help the student understand the course design as well as make better choices about how best to gain mastery of the material and be successful in this class.

B. Flipped Classroom Instruction

Under the flipped classroom model, students begin learning the course material at home before class, while class time is focused on solidifying understanding through active discussion and problems solving:

Before class:

- Read textbook or lecture slides, or watch lecture videos
- Self-assess using Pre-class Assessment on WebAssign
- Prepare questions for class discussion

During class:

- Participate in class discussion facilitated by the instructor
- Work in groups or individually on in-class assignments, with instructor support
- Receive individual and/or small group instruction as needed

After class:

- Prepare for assessments and reassessments
  - Work practice problems on WebAssign
  - Take practice quizzes in the Personal Study Plan on WebAssign
  - Attend instructor and LA office hours
  - Utilize MAPEL Center tutoring
- Take assessments and reassessments as needed

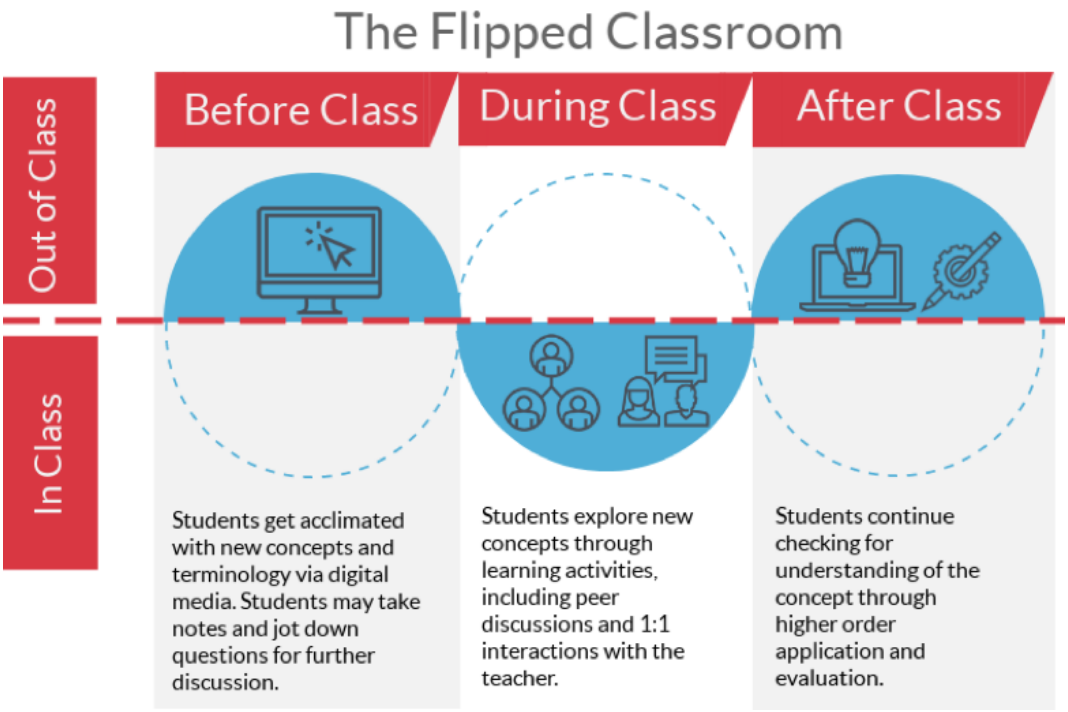

Figure 2 - The Flipped Classroom, from https://www.odysseyware.com/blog/using-classpace-flipped-classroom

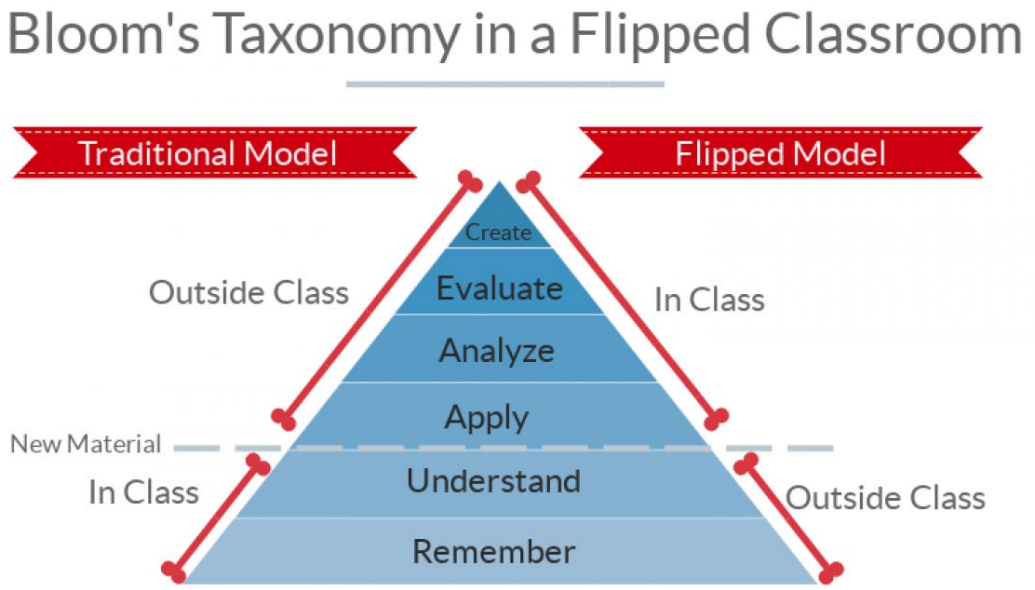

Figure 3 - Bloom's Taxonomy in a Flipped Classroom, from https://www.odysseyware.com/blog/using-classpace-flipped-classroom

While preparing for class, students have their initial exposure to the new material through reading the textbook and lecture slides and watching lecture videos. The focus at this time is on the *Remember* and *Understand* levels of Bloom's Taxonomy:

- Memorize definitions and theorems
- Paraphrase definitions and theorems
- Understand worked examples

During class, students work with each other and the instructor to develop the *Apply*, *Analyze*, and *Evaluate* levels of Bloom's Taxonomy. Occasionally, students are expected to reach the *Create* level of Bloom's Taxonomy. After class, students should focus on consolidating their learning through additional practice and self-assessment in order to demonstrate mastery of course standards.

It is essential that students put in the time and effort necessary in and out of class. It is generally recommended that for each hour of in-class time, the student spends 2-3 hours out of class studying. This class meets for 5 hours each week, therefore, ***students should expect to spend 10 – 15 hours outside class time studying for this class.***

C. Course Standards

This course has 28 core standards and 19 advanced standards (47 standards total). The 28 core standards are essential material which must be mastered in order to pass the course with a grade of "C" or above. Most core standards are at the Apply and Analyze levels of Bloom's Taxonomy. The advanced standards are either optional additional topics or a higher level question for a core standard topic. Mastery of advanced standards are used to earn "A" or "B" grades provided the student has mastery of all core standards. Detailed grading criteria can be found in sections D. Course Grade and E. Standards.

MATH181 Calculus I Course Standards
Classes of functions analyzed in MATH181: algebraic functions, trigonometric and inverse trigonometric functions, exponential functions, logarithmic functions, parametric functions

	Code	Standard
C	**2.1T**	**Recognize and sketch tangent lines in various situations**
C	**2.1V**	**Estimate instantaneous velocity from average velocity by selecting appropriate points**
C	**2.2L**	**Estimate limits and one-sided limits graphically and numerically, and also recognize when a limit does not exist**
C	**2.3L**	**Use limit laws to evaluate limits and one-sided limits and demonstrate when a limit does not exist**
A	2.3Q	Apply the Squeeze Theorem appropriately to evaluate limits
C	**2.4C**	**Determine where a function is continuous graphically and algebraically, and describe the type of discontinuity**
A	2.4IVT	Apply the Intermediate Value Theorem appropriately and state its consequences
C	**2.5A**	**Graphically work with vertical and horizontal asymptotes and limits involving infinity**
A	2.5L	Evaluate limits involving infinity using limit laws and infinite arithmetic
C	**2.6DI**	**Interpret the derivative as the slope of the tangent line and as the instantaneous rate of change**
A	2.6DC	Calculate the derivative using its definition as the limit of a difference quotient
C	**2.7-8R**	**Recognize f, f', f'' from given graphs**
A	2.7-8SF	Use the graph of f to sketch a graph of f'
C	**2.7-8D**	**Determine where a function is differentiable graphically and algebraically, and describe why it is not differentiable**
A	2.7-8SA	Use the graph of f' to sketch a graph of f
C	**3.1-7B**	**State the derivatives of basic functions**
C	**3.1-7DR**	**Differentiate sum, difference, product, quotient, and composition of functions**

C	**3.1-7LD**	**Recognize and apply logarithmic differentiation when appropriate**
C	**3.1-7ID**	**Recognize and apply implicit differentiation when appropriate**
C	**3.1-7TE**	**Determine where a curve has a horizontal or vertical tangent, and calculate equations of tangent lines for explicit functions**
A	3.1-7TI	Determine where a curve has a horizontal or vertical tangent, and calculate equations of tangent lines for implicit functions
A	3.1-7TP	Determine where a curve has a horizontal or vertical tangent, and calculate equations of tangent lines for parametric functions
C	**3.8M**	**Derive velocity and acceleration from the position function and use them to answer questions about an object in motion**
A	3.8O	Other applications of the derivative in physics, chemistry, biology, economics, etc.
C	**3.9L**	**Calculate the linearization for a function and determine whether it is an over or under approximation**
A	3.9D	Use differentials to approximate change and error
A	4.1RR	Model related rates as a mathematical equation and solve the problem using calculus
C	**4.2MM**	**Use calculus to determine the local and absolute extrema of a function on a given interval**
A	4.3MVT	Apply the Mean Value Theorem appropriately and state its consequences
C	**4.3G**	**Use the functions f' and f'' to answer questions about the graph of f.**
C	**4.5IF**	**Recognize all indeterminate forms: 0/0, inf/inf, 0*inf, inf-inf, 1^inf, inf^0, 0^0**
C	**4.5LH**	**Evaluate limits of the form 0/0 and inf/inf**
A	4.5LO	Evaluate limits of the difference, product, and exponential indeterminate forms
A	4.6O	Model the quantity to be optimized as a mathematical function and solve the optimization problem using calculus.
C	**4.7NA**	**Apply Newton's Method to approximate zeros to a given degree of accuracy**
A	4.7NF	Recognize when and explain why Newton's Method fails to converge to the desired zero
C	**4.8C**	**Calculate the most general and specific antiderivatives of basic functions**
C	**5.1RS**	**Compute left, right, and midpoint approximations of areas and state (if possible) whether the approximations are over or under estimates**
C	**5.2RS**	**Express definite integrals as limits of Riemann sums, including the use of sigma notation**
A	5.2DI	Express and evaluate a definite integral as the limit of a Riemann sum
C	**5.2P**	**Use the properties of definite integrals to compute new integrals from known integrals**
C	**5.3ET**	**Evaluate definite integrals using the Evaluation Theorem**
C	**5.3EI**	**Recognize and evaluate indefinite integrals**
A	5.3M	Set up and evaluate integrals to find displacement and total distance traveled from a velocity function.
A	5.4AF	Analyze an "area under f" function from a graph of f.
A	5.4FTC	State both parts of the FTC and explain its consequences and significance.
C	**5.4D**	**Use FTC (and chain rule) to find the derivative of area functions.**
	28	**Core Standards**
	19	Advanced Standards

D. Course Grade

This course uses Standards Based Grading. Your course grade will be based solely on mastery of the course standards and completion of the honors coursework. Assessments of standards will be graded as follows:

Score	Mastery Level	Student work
4	Perfect Mastery	Demonstrates complete understanding of the underlying concept and provides correct solution with appropriate notation and use of language
3	Imperfect Mastery	Demonstrates complete understanding of the underlying concept but has minor errors in calculation and/or problems with notation and use of language
2	Developing	Demonstrates developing but incomplete understanding of the concept and/or major errors in the computation and presentation of the solution
1	Novice	Demonstrates little to no understanding of the concept with some relevant computations
0	No evidence	Demonstrates no evidence of understanding or not attempted

Both Perfect Mastery (4) and Imperfect Mastery (3) are considered mastery. A student is only required to demonstrate mastery on a standard once.

There will be three (3) opportunities for demonstrating mastery on each standard:

1. Initial assessments weekly as indicated on the course schedule
2. Reassessment the week following the initial assessments
3. Final assessment during final exam week

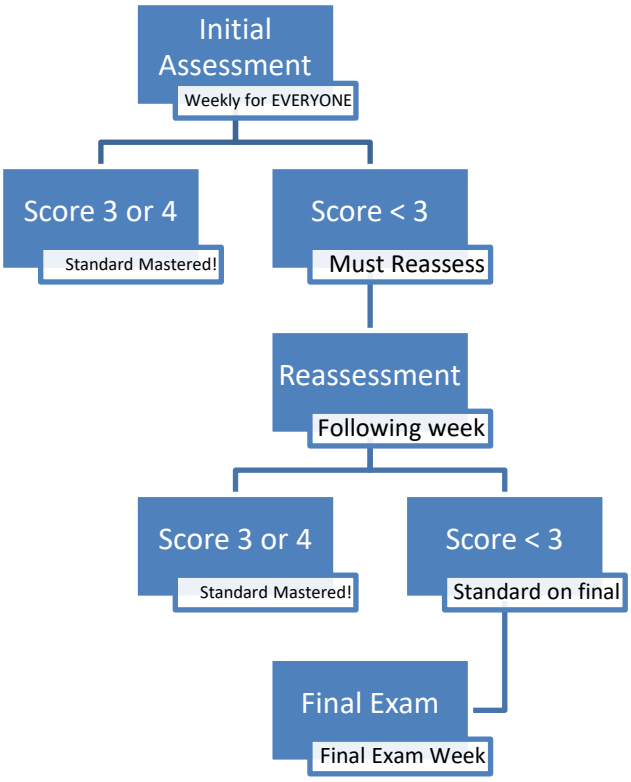

Figure 4 - Assessment Flowchart

E. Standards

Final letter grades will be determined according to this rubric:

Core Standards	Advanced Standards	Honors Coursework*	Final Grade
Mastery on all	Average score is 3 or above	Complete and satisfactory	A
Mastery on all	Average score is between 2 and 3	Partially complete and satisfactory	B
Mastery on all	Average score is below 2	Unsatisfactory	C
Not all mastered Average score is 2 or above	Not applicable	Not applicable	D
Not all mastered Average score is below 2	Not applicable	Not applicable	F

Note:

- Mastery means a score of 3 or 4.
- For the grades of A, B, or C, you must demonstrate mastery on ALL Core Standards.
- Advanced Standards and Honors Coursework are NOT considered for final grade determination until ALL Core Standards are mastered.
- *See Section VIII. Honors Coursework for more details.

F. Assessments and Make-up Policy

Students have a 24-hour window to take initial and reassessments each week (starting in Week 2) between Tuesday 10:00 am and Wednesday 10:00 am.

The Final Exam will be given during the 48-hour window between Sunday, December 13, 12:15 pm and Tuesday, December 15, 12:15 pm.

Make-ups for missed assessments will not be available.

VI. Student Code of Conduct

A. Standards of College Behavior

Students are expected to adhere to the Montgomery College Student Code of Conduct: https://www.montgomerycollege.edu/_documents/policies-and-procedures/42001-student-code-of-conduct.pdf

B. Academic Honesty

All assessments in this class are closed-notes, closed-book, and individual. No collaboration is allowed on any assessment. All students are required to sign an honor pledge prior to taking any assessments for the course. Once the student has agreed to abide by the honor pledge the student will be able to self-proctor according to these rules:

- Student will not open the assessment questions prior to taking the assessment

- Student will not consult any resources (textbook, notes, internet, another person, etc.) other than the use of an approved calculator while completing the assessment
- Student will not discuss the assessment with anyone other than the instructor or LA prior to the due date

Students should refer to the Student Code of Conduct or the following excerpt for more details:
https://www.montgomerycollege.edu/_documents/academics/support/learning-centers/writing-reading-learning-ctr-germantown/academic-dishonesty-and-how-it-is-handled.pdf

VII. Collegewide Policies and Procedures

A. Attendance Policy

Students are expected to attend and actively participate in all class meetings. As group work is often part of class, students who regularly miss class will no longer be assigned a group.

B. Withdrawal and Refund Dates

- Refund Drop Deadline – September 8, 2020
- No Grade Drop & Audit/Credit Deadline – September 22, 2020
- W Grade Drop Deadline – November 17, 2020

C. Audit Policy

All students registered for audit are required to consult with the instructor before or during the first class session in which they are in audit status, and students are required to participate in all course activities unless otherwise agreed upon by the student and instructor at the time of consultation. Failure to consult with the instructor or to so par-ticipate may result in the grade of "W" being awarded. This action may be taken by the in-structor by changing the "AU" to "W" before the drop with "W" date.

D. Disability Support Services

Any student who needs an accommodation due to a disability should make an appointment to see me during my office hours. In order to receive accom-modations, a letter from Disability Support Services (G-SA 189; R-CB 122; or TP/SS-ST 122) will be needed. Any student who may need assistance in the event of an emergency evacuation must identify to the Disability Support Services Office; guidelines for emergency evacuations for individuals with disabilities are found at:
http://www.montgomerycollege.edu/dss

E. Veteran's Services

If you are a veteran or on active or reserve status and you are interested in infor-mation regarding opportunities, programs and/or services, please visit the Combat2Col-lege website at http://www.montgomerycollege.edu/combat2college

F. Delayed Opening or Closing of the College

If a class can meet for 50% or more of its regularly scheduled meeting time OR if the class can meet for 50 minutes or more, it will meet. Montgomery College will always operate on its regular schedule unless otherwise announced. Depending on the nature of the incident, notifications of emergencies and changes to the College's operational status will be communicated through one or more communication methods including the College's website http://www.montgomerycollege.edu. For the most up-to-date information regarding College openings, closings, or emergencies, all students, faculty, and staff are encouraged to sign up for email and text alerts via Montgomery College ALERT. Registration information is available at http://www.montgomerycollege.edu/emergency.

G. Communication

This course will use your official Montgomery College email address, Microsoft Teams, and Microsoft OneNote for communication. This course will NOT use Blackboard for communication.

VIII. Honors Coursework

A. Requirements

The student will select one full-length or two mini "Primary Source Projects" (PSPs) in consultation with the instructor from these two repositories:

- Transforming Instruction in Undergraduate Mathematics via Primary Historical Sources (TRIUMPHS) https://blogs.ursinus.edu/triumphs/
- Learning Discrete Mathematics and Computer Science via Primary Historical Sources https://www.cs.nmsu.edu/historical-projects/

Students are not limited to topics within calculus. Each PSP's tasks and exercises must be typeset in LaTeX on Overleaf (https://www.overleaf.com/).

The student will create a presentation (oral or poster) along with an annotated bibliography. The presentation will be delivered during the last week of classes.

B. Honors Coursework Schedule

Date	Honors Coursework due
Wed 9/09	Selection of PSP's
Fri 9/18	PSP Check-in 1
Fri 10/02	PSP Check-in 2
Fri 10/23	PSP Check-in 3
Fri 11/06	PSP Check-in 4
Fri 11/20	Presentation/Paper & Bibliography – first draft
Fri 12/04	Presentation/Paper & Bibliography – second draft
Mon 12/07 - Fri 12/11	Presentations
Fri 12/18	PSP write-ups, Presentation & Bibliography – final draft

IX. Schedule

Date	Section Title	Section Number	Assessments	
			Initial	Reassess
Monday, Aug 31	The Tangent and Velocity Problems	2.1		
Wednesday, Sep 2	The Limit of a Function	2.2		
Friday, Sep 4	Calculating Limits Using Limit Laws	2.3		
Labor Day				
Wednesday, Sep 9	Calculating Limits Using Limit Laws	2.3	2.1, 2.2	
Friday, Sep 11	Continuity	2.4		
Monday, Sep 14	Limits Involving Infinity	2.5		
Wednesday, Sep 16			2.3, 2.4	2.1, 2.2
Friday, Sep 18	The Derivative	2.6 - 2.8		
Monday, Sep 21				
Wednesday, Sep 23			2.5, 2.6	2.3, 2.4
Friday, Sep 25	Differentiation Rules	3.1 - 3.4 (1.5, 1.7)		
Monday, Sep 28				
Wednesday, Sep 30			2.7, 2.8	2.5, 2.6
Friday, Oct 2				
Monday, Oct 5	Differentiation Techniques	3.5 - 3.7 (1.6)		
Wednesday, Oct 7				2.7, 2.8
Friday, Oct 9				
Monday, Oct 12	Midterm Exam Review			
Midterm Exam 48-hour window October 12, 10:00 am - October 14, 10:00 am				
Wednesday, Oct 14	Rates of Change	3.8	3.1 - 3.7	
Friday, Oct 16	Related Rates	4.1		
Monday, Oct 19				
Wednesday, Oct 21	Min & Max Values	4.2	3.8	3.1 - 3.7
Friday, Oct 23				
Monday, Oct 26	Derivatives & Graphing	4.3, 4.4		
Wednesday, Oct 28			4.1, 4.2	3.8
Friday, Oct 30	Optimization	4.6		
Monday, Nov 2				
Wednesday, Nov 4	Linear Approximation & Differentials	3.9	4.3, 4.6	4.1, 4.2
Friday, Nov 6	Newton's Method	4.7		
Monday, Nov 9	Indeterminate Forms & L'Hospital's Rule	4.5		
Wednesday, Nov 11	Areas & The Integral	5.1, 5.2	3.9, 4.7	4.3, 4.6
Friday, Nov 13				
Monday, Nov 16	Antiderivatives	4.8		
Wednesday, Nov 18	The FTC	5.3, 5.4	4.5, 5.1, 5.2	3.9, 4.7
Friday, Nov 20				

Monday, Nov 23				
Thanksgiving Break				
Monday, Nov 30	The Substitution Rule	5.5		
Wednesday, Dec 2	More About Areas	6.1	4.8, 5.3, 5.4	4.5, 5.1, 5.2
Friday, Dec 4	Final Exam Review			
Monday, Dec 7	Presentations			
Wednesday, Dec 9	Presentations			4.8, 5.3, 5.4
Friday, Dec 11	Presentations			
Final Exam 48-hour window December 13, 12:15 pm - December 15, 12:15 pm				

The professor reserves the right to make changes to this syllabus.

Last Updated June 28, 2021