MONTGOMERY COLLEGE - Germantown Campus
Mathematics & Statistics Department
Course Syllabus

I. Instructor Information

Professor: Zhou Dong
Email: Zhou.Dong@MontgomeryCollege.edu
[1]Phone: (240) 567-7810
[2]Office: HT 134 Germantown campus

Office Hours:

Drop-in virtual office hours	MW 5:00 pm – 5:25 pm and TR 10:15 am – 11:00 am
Click here to join the MW office hours Click here to join the TR office hours	
In-person office hours	M 9:30 am – 12:00 pm in HT134
Appointment hours	MW 9:30 am – 12:00 pm and T 11:00 am – 2:30 pm
Click here to book an appointment	

Learning Assistant: Amy Tran
Email: atran77@montgomerycollege.edu
Office Hours: TBA

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.

Fall 2021: CRN 22780
Class Times: TR 8:00 am – 10:10 am

[1] If you call, please leave a message. Best way to reach me during Remote Instruction is to message me on Microsoft Teams.
[2] I will only be available in my office on Mondays 9:30 am – 12:00 pm.

Teams class meeting link

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:

- *Contemporary Calculus*, by Dale Hoffman.
  - This free text can be access online at http://scidiv.bellevuecollege.edu/dh/Calculus_all/Calculus_all.html
- *MyOpenMath* – for access to online homework.
  - Register for a free student account at https://www.myopenmath.com/
  - MyOpenMath Course Enrollment Key: **mcmath181dong**
- *Graphing calculator*
  - A TI-83 or TI-83 Plus (http://wabbitemu.org/)
  - Desmos (www.desmos.com/calculator)
- *Microsoft Teams and OneNote* – for course meetings, announcements and communication.
  - MC students can download these programs for free from their Microsoft 365 account accessed through MyMC.
  - **Link to Team**

Requirements for remote instruction:

- New hardware specifications, for general and several specific programs, have been updated to help prepare students for online learning and ensure that all systems used will function properly. Please visit the Hardware Specifications page for the most up-to-date information.
- Cable service providers in the Montgomery County area (Comcast, RCN, and Verizon) are offering low-cost monthly internet service options to low-income residents. For eligibility requirements and additional information visit Low-Cost Home Internet Access.

V. Course Design

This course is designed to give the student a high degree of autonomy and students are expected to self-direct their learning. While many resources are provided for the student to aid in their learning, the final course grade is based solely on the student's mastery of the course standards as determined through assessments (see section B. Course Grade for details). This means it is up to the student to determine which resources to use (e.g. class attendance, textbook, lecture videos, online practice problems, etc.) in order to gain mastery of the course standards. Feedback on online assignments are provided for learning purposes only and will not affect the student's final course grade.

A. Bloom's 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.

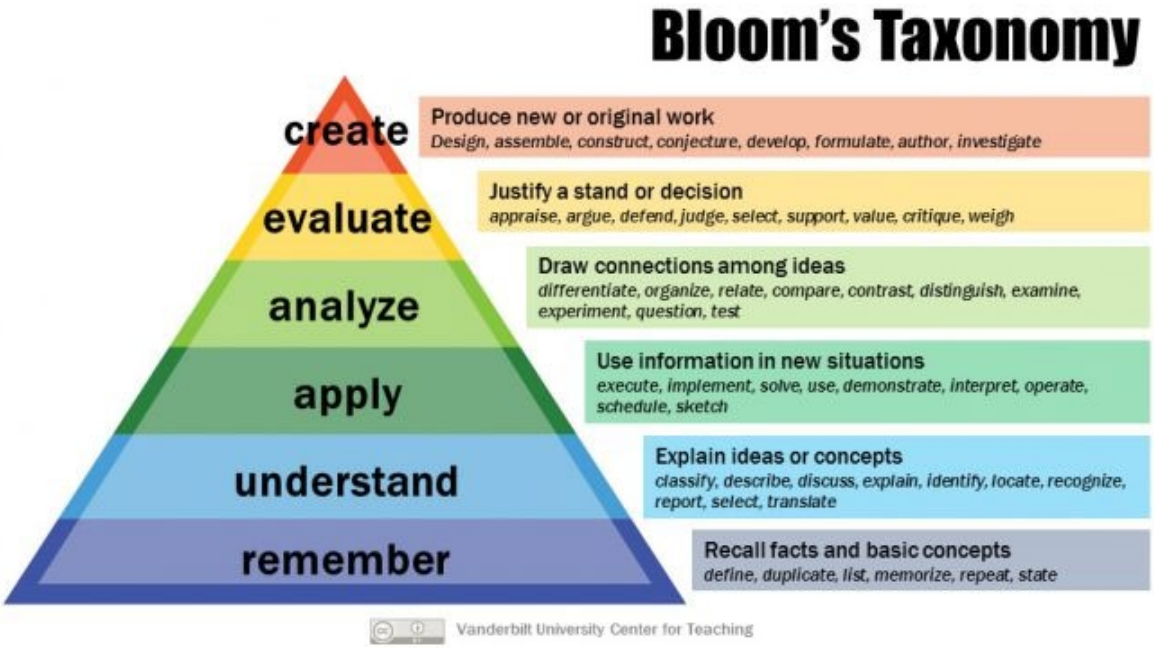

Figure 1 - Bloom's Taxonomy, from https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/

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
  - Complete Practice Problem Assignments 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

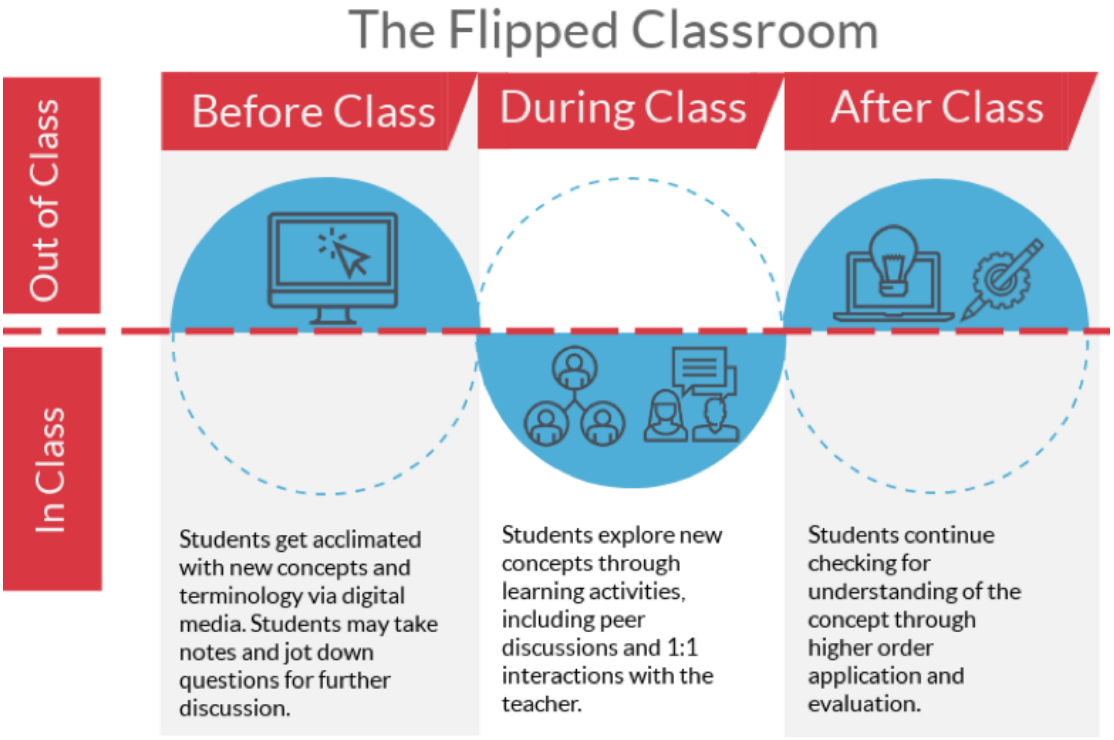

Figure 2 - The Flipped Classroom, from https://www.odysseyware.com/blog/using-classpace-flipped-classroom

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.

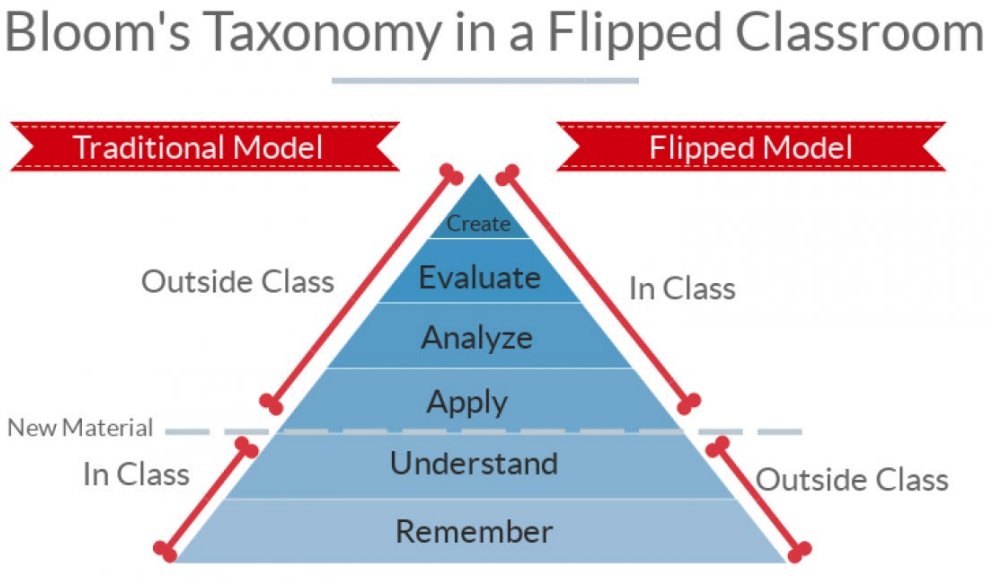

Figure 3- Bloom's Taxonomy in a Flipped Classroom, from https://www.odysseyware.com/blog/using-classpace-flipped-classroom

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.***

VI. Course Requirements

A. Course Standards

This course has 30 core standards and 19 elective standards (49 standards total). The 30 core standards are essential material and EACH standard must be mastered in order to earn a grade of "C" or above. Most core standards are at the Apply and Analyze levels of Bloom's Taxonomy. The elective standards are either optional topics or a higher level question for a core standard topic. Detailed grading criteria can be found in section D. Course Grade and section E. Standards.

Core Elective	Standard Code	Standard Description
C	0.1BP	State the two basic problems of calculus.
C	0.5AO	State whether an element is a member of "A and B" and "A or B" for given sets A and B.

C	0.5IF	State whether a given "If… then…" statement is true or false and justify the answer.
E	0.5HC	State which parts of a mathematical statement are assumptions (hypotheses) and which parts are conditions.
E	0.5CP	State the contrapositive (equivalent) form of an "If… then…" statement.
C	1.1LG	Determine the values of limits (one- and two-sided) for a function or determine that the limits do not exist based on its graph or a table of values.
C	1.2LA	Use algebraic methods (not including the squeeze theorem) to determine the values of limits (one- and two-sided) for a function or determine that the limits do not exist.
E	1.2SQ	Apply the Squeeze Theorem appropriately to compute limits.
C	1.3CD	Apply the definition of continuity to determine whether a given function is continuous at a point.
E	1.3IV	Determine the number of times a function has a given value by using the Intermediate Value Theorem for continuous functions.
E	1.3BA	Approximate roots of functions by using the Bisection Algorithm.
C	1.4DE	For a given epsilon, find the required delta graphically and algebraically (for linear and quadratic functions).
E	1.4PF	Apply the "epsilon-delta" definition to prove statements about limits.
C	2.0ES	Estimate a tangent line slope and an instantaneous rate of change from the graph of a function.
C	2.1DM	State the graphic and rate meanings of f'(x) and apply the correct units to the result.
C	2.1TL	Write the equation of the line tangent to the graph of a function.
C	2.1DN	Recognize and use the common equivalent notations for the derivative.
E	2.1DD	Apply the definition of f'(x) to calculate its value.
C	2.2CD	State whether a function (given by a graph or formula) is continuous or differentiable at a point or on an interval.
C	2.3DF	Calculate the derivatives of elementary functions and combinations (not including compositions) of elementary functions (not including logarithms).
E	2.3HD	Calculate second and higher order derivatives and state what they measure.
C	2.5DC	Calculate the derivatives of elementary functions and compositions of elementary functions (including logarithms).
E	2.5PD	Calculate the derivatives of functions given as parametric equations and interpret their meanings geometrically and physically.
C	2.6RR	Solve related rate problems using derivatives.
C	2.7NM	Approximate the solutions of equations by using derivatives (Newton's method).
E	2.7NF	Analyze situations in which Newton's Method fails to converge to the desired root.
C	2.8LA	Approximate the values of "difficult" functions by using derivatives.
E	2.8DF	Calculate the differential of a function using derivatives and show what the differential represents on a graph.
E	2.9IM	Calculate the derivatives of "really difficult" functions by using the method of Implicit Differentiation.
E	2.9LD	Calculate the derivatives of "really difficult" functions by using the method of Logarithmic Differentiation.
C	3.1MM	State whether a given point on a graph is a "global/local maximum/minimum".
C	3.1CE	Find critical points and extreme values (max/min) of functions by using derivatives.
E	3.2RM	Graphically and using derivatives, find the values guaranteed to exist by Rolle's Theorem and by the Mean Value Theorem.
C	3.3GD	Use the graph of f to sketch the shape of the graph of f'.

E	3.3GA	Use values of f' to sketch the graph of f and state whether f is increasing or decreasing at a point.
C	3.4CC	Use values of f" to determine the concavity of the graph of f.
C	3.4DV	Use the graph of f to determine if f" is positive, negative, or zero.
E	3.5AM	Solve applied max/min problems by using derivatives and restate in words the meanings of solutions to applied problems, attaching the appropriate units to an answer.
C	3.6AL	Determine asymptotes of a function by using limits.
C	3.7LH	Apply L'Hopital's Rule to compute limits of 0/0 and ∞/∞ forms.
E	3.7IF	Determine the values of other indeterminate form limits by using derivatives and L'Hopital's Rule.
C	4.1SM	Evaluate a sum given in sigma notation.
C	4.1RS	Set up an area as a Riemann sum.
C	4.2DI	Define the definite integral of a function.
C	4.3PR	Define the properties of definite integrals as properties of areas.
E	4.4AD	Use the various interpretations of the definite integral to solve problems of area, distance and accumulation and assign correct units to the result.
C	4.5FT	State and describe the meaning of the Fundamental Theorem of Calculus.
C	4.5EV	Use antiderivatives to exactly evaluate definite integrals.
E	4.6CV	Determine antiderivatives using the method of Change of Variable (U-Substitution).

B. Course Grade

This course uses Standards Based Grading. Your course grade will be based solely on mastery of the course standards. 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 (score = 4) and Imperfect Mastery (score = 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)
2. Reassessment the week following the initial assessments

3. Final assessment during final exam week

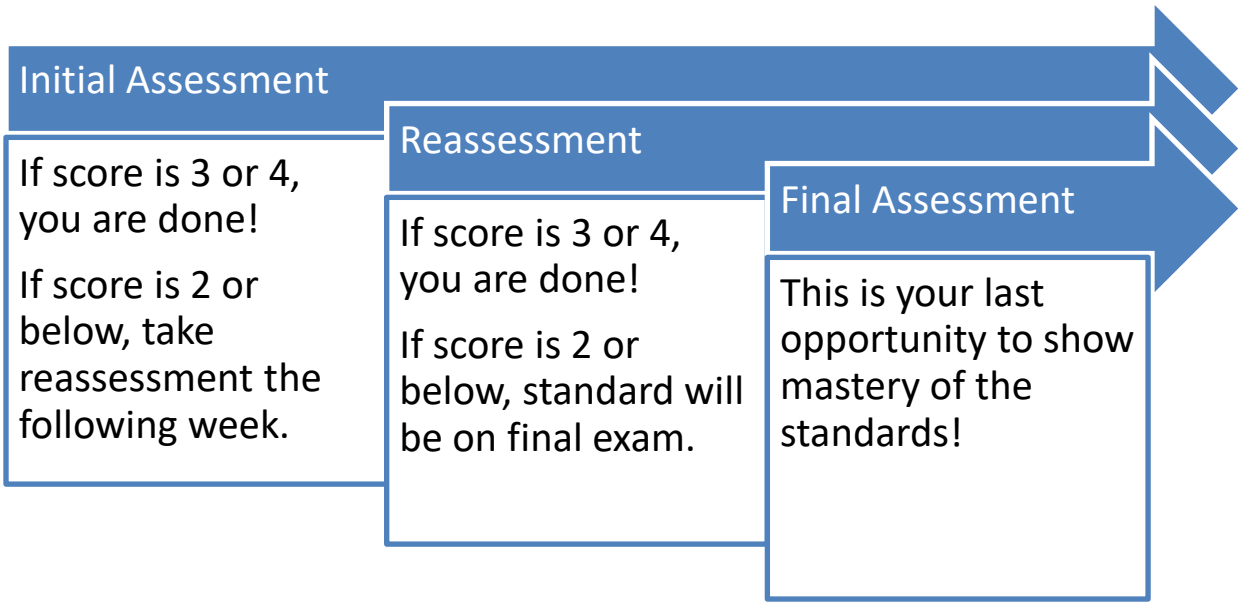

Figure 4 Assessment flow chart

C. Standards

Final letter grades will be determined according to this rubric:

Grade	**Core Standards**	**All standards (Core and Elective)**
A	Mastery on all	Average score is 3.4 or above
B	Mastery on all	Average score is between 3 and 3.4
C	Mastery on all	Average score is below 3
D	Not all mastered	Average score is above 2
F	Not all mastered	Average score is below 2

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.

D. Assessments and Make-up Policy

Students have a 24-hour window to take initial and reassessments each week starting in Week 2. Date and time will be determined during the first week of classes.

The Final Exam will be given during the 24-hour window during final exam week. Date and time will be determined during the last week of classes.

Make-ups for missed assessments will not be available. All assignments on MyOpenMath have LatePass allowed (automatic extensions).

VII. 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

VIII. Collegewide Policies and Procedures

A. Attendance Policy

Students are encouraged 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. Students who miss more than one week of class and assessments may be dropped from the course for excessive absences as per the Montgomery College Academic Regulations and Standards.

B. Withdrawal and Refund Dates

- Refund Drop Deadline – September 8, 2021
- No Grade Drop & Audit/Credit Deadline – September 22, 2021
- W Grade Drop Deadline – November 17, 2021

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 information regarding opportunities, programs and/or services, please visit the Combat2College 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.

IX. Honors Module

This class has an attached honors module for eligible students. Enrollment is limited to students who meet Honors Program eligibility standards. If you are interested in taking this as an honors class, you must meet with the instructor during the first two weeks of classes.

A. Honors Eligibility

- Completion of at least 12 Montgomery College credits
- Cumulative 3.2 grade point average or higher
- Grade of A or B in ENGL 101 or ENGL 101A

X. Schedule

A. Class Meeting Schedule

Week	Date	Class Topic
	Tue 8/31	How to Succeed in Calculus Advice from Successful Calculus Students Chapter 0 -- Review and Preview
1	Thu 9/02	1.0 Slopes & Velocities 1.1 Limit of a Function
	Tue 9/07	1.2 Limit Properties
2	Thu 9/09	1.3 Continuous Functions
	Tue 9/14	1.4 Formal Definition of Limit
3	Thu 9/16	2.0 Slope of a Tangent Line
	Tue 9/21	2.1 Definition of Derivative
4	Thu 9/23	2.2 Differentiation Formulas
	Tue 9/28	2.3 More Differentiation Patterns
5	Thu 9/30	2.4 Chain Rule (!!!)
	Tue 10/05	2.5 Using the Chain Rule
6	Thu 10/07	2.6 Related Rates
	Tue 10/12	2.7 Newton's Method
7	Thu 10/14	2.8 Linear Approximation
	Tue 10/19	Advising Day - No classes
8	Thu 10/21	2.9 Implicit Differentiation
	Tue 10/26	3.1 Introduction to Maximums & Minimums
9	Thu 10/28	3.2 Mean Value Theorem
	Tue 11/02	3.3 f' and the Shape of f 3.4 f'' and the Shape of f
10	Thu 11/04	3.5 Applied Maximums & Minimums
	Tue 11/09	3.6 Asymptotes
11	Thu 11/11	3.7 L'Hospital's Rule
	Tue 11/16	4.0 Introduction to Integrals 4.1 Sigma Notation & Riemann Sums
12	Thu 11/18	4.2 The Definite Integral
	Tue 11/23	4.3 Properties of the Definite Integral
13	Thu 11/25	Thanksgiving - No classes
	Tue 11/30	4.4 Areas, Integrals and Antiderivatives
14	Thu 12/02	4.5 The Fundamental Theorem of Calculus
	Tue 12/07	4.6 Finding Antiderivatives
15	Thu 12/09	Presentations Final Exam Review
	Tue 12/14	Final Exam

B. Assessment Schedule

Week	Date	Assessments
1	Tue 8/31	NA
2	Tue 9/07	Initial Assessments: 0.1, 0.5, 1.1
3	Tue 9/14	(Reassessments: 0.1, 0.5, 1.1) Initial Assessments: 1.2, 1.3
4	Tue 9/21	(Reassessments: 1.0, 1.2) Initial Assessments: 1.4, 2.0
5	Tue 9/28	(Reassessments: 1.4, 2.0) Initial Assessments: 2.1, 2.2
6	Tue 10/05	(Reassessments: 2.1, 2.2) Initial Assessments: 2.3
7	Tue 10/12	(Reassessments: 2.3) Initial Assessments: 2.5, 2.6
8	Tue 10/19	(Reassessments: 2.5, 2.6) Initial Assessments: 2.7, 2.8
9	Tue 10/26	(Reassessments: 2.7, 2.8) Initial Assessments: 2.9
10	Tue 11/02	(Reassessments: 2.9) Initial Assessments: 3.1, 3.2
11	Tue 11/09	(Reassessments: 3.1, 3.2) Initial Assessments: 3.3, 3.4, 3.5
12	Tue 11/16	(Reassessments: 3.3, 3.4, 3.5) Initial Assessments: 3.6, 3.7
13	Tue 11/23	(Reassessments: 3.6, 3.7) Initial Assessments: 4.0, 4.1, 4.2
14	Tue 11/30	(Reassessments: 4.0, 4.1, 4.2) Initial Assessments: 4.3
15	Tue 12/07	(Reassessments: 4.3) Initial Assessments: 4.4, 4.5 Initial Assessment: 4.6
Final Exam Week	Tue 12/14	(Reassessments: 4.4, 4.5, 4.6) Final Assessments: all

Important Dates

Date	Event
September 8	Refund drop deadline – you must drop the course by this date for a refund
September 22	No grade drop deadline – you must drop the course by this date to not receive a grade
November 17	W grade drop deadline – you must drop the course by this date to receive a W grade
November 25	Thanksgiving – no class
December 14	Final Exam

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

Last Updated November 11, 2021