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# CALCULUS I

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Spring 2021 | Syllabus | Math 170-01

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## CLASS INFORMATION

### Professor

Lauren Williams, PhD

### Meeting Times

MTWF 8:00 - 8:50

### Meeting Location

Hirt 207

## ZOOM OFFICE HOURS

Monday 12 - 12:50  
Tuesday 9 - 10, 12 - 1:50  
Wednesday 12 - 12:50  
Thursday 9 - 10

## CONTACT

### Email

lwilliams@mercyhurst.edu

### Office

Old Main 404

### Office Phone

(814) 824-2226

## COURSE DESCRIPTION

This is the initial course in a sequence of courses on the fundamental ideas of the calculus of one variable. It is here that truly significant applications of mathematics begin. Topics included are functions, continuity, limits, derivatives, maxima and minima and antiderivatives.

## COURSE OBJECTIVES

On successful completion of the course, students will be able to:

- recognize, define, and apply properties of functions, such as their domain, range, intercepts, and inverses;
- be able to evaluate a variety of limits;
- identify discontinuities of a function presented either graphically or algebraically;
- find the derivative of functions using the limit definition;
- find the derivative of sums, products, and quotients of composite polynomial, trigonometric, exponential, and logarithmic functions;
- understand conceptual relationships between derivatives, rates of change, and tangent lines;
- use properties of functions and derivatives to graph functions;
- apply differentiation procedures to solve related rates and extreme value problems;
- identify and evaluate limits involving indeterminate forms;
- compute definite and indefinite integrals using formulas and substitution;
- understand the relationship between the integral and the derivative; and
- read and interpret mathematical theorems, including checking that hypotheses are satisfied and reaching correct conclusions.

## PREREQUISITES

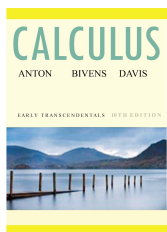
To remain enrolled in this course, you must satisfy at least one of the following criteria:

- Began studying at Mercyhurst prior to Fall 2016
- Score of 70 or better on the ALEKS Mathematics Placement Assessment
- Passed Math 118 (Math for the Natural Sciences), or transfer credit for equivalent
- Passed both Math 111 (College Algebra) and Math 112 (Trigonometry and Functions), or transfer credit for equivalent

If none of these apply, you should make arrangements to take the ALEKS Math Placement Assessment before the Add/Drop deadline on January 29th. **Students that do not meet the prerequisites by this deadline may be dropped from the course.** You will be contacted via email by the instructor reminding you to show proof of meeting prerequisites before any action is taken.

## REQUIRED MATERIALS

### Textbook



Calculus, Early Transcendentals by Anton, Bivens, and Davis, 10th Edition. We will be covering chapters 0-5 in the textbook. No other supplies are required for the course.

You will not be expected to bring your textbook to class. If you prefer to purchase or rent an electronic version of the text, you're welcome to do so.

### Calculators

You are not required to purchase a calculator for this course, and **you will not be permitted to use a calculator or other electronic device on any quizzes or exams.** You are strongly encouraged to avoid using a calculator while working on homework.

### Moodle

At the beginning of the semester, you will receive a code to register for our course on Moodle. This is a free site created for this course by the Mercyhurst Mathematics Department. While most materials will also be posted on Blackboard, you will need to access Moodle for the course quizzes. You will receive an email to your Mercyhurst address with further information on creating your Moodle account.

## IMPORTANT DATES

### January

Jan 25: First Day of Class  
Jan 29: Last Day to Add/Drop

### February

#### Feb 19: Exam 1

Feb 17: Break, No Class

### March

Mar 15: Fake Wednesday  
Mar 16: Advising Day

#### Mar 19: Exam 2

Mar 30: Fall Registration Open

### April

Apr 7: Break, No Class  
Apr 2: Last Day to Declare P/F  
Apr 9: Last Day to Withdraw

#### Apr 16: Exam 3

Apr 29: Break, No Class

### May

#### May 5: Exam 4

May 6: Spring Classes End  
May 7: Reading Day  
May 10-13: Final Exam Week

## COURSE COMPONENTS

### Quizzes

Keeping up with the homework will ensure that you are prepared for the quizzes, which will feature problems very similar to those in the homework as well as more conceptual questions about the topics you'll see each week.

There will be a total of 10 quizzes available for the semester. Your lowest quiz grade will be dropped when calculating your final grade, including a missed quiz (so only your best 9 quiz grades will be counted towards your final grade).

### Exams

We will have four exams as shown on the course schedule. Information about how exams will be delivered and submitted will be given before each exam. Your lowest exam grade, including a missed exam, will be replaced the average of your other three exam grades. This policy **does not** apply to exam grades of 0 due to academic dishonesty.

## QUIZ AND EXAM POLICIES

In addition to the usual University policies regarding academic honesty, please be sure to follow the specific requirements for this course when taking quizzes or exams:

### You may...

- refer to your textbook and course materials while taking quizzes.
- contact me during an exam for clarification on an exam question, grading policy, etc.

### You may NOT...

- refer to any materials besides the textbook or course materials. This includes solution manuals, web pages, etc. If it is not on Moodle, Blackboard, or in the textbook, do not use it while taking an exam!
- use mathematical software or apps such as Wolfram Alpha, CoCalc, Photomath, or any other utilities.
- ask for help or clarification from a classmate, friend, family member, online service such as Chegg, or anyone besides the instructor of the course.
- assist a classmate that requests help or information about a quiz or exam.

Violations of this policy may result in a grade of 0 on the quiz or exam. Severe or repeated instances of academic dishonesty will result in an academic dishonesty report to the University.

## GRADES

Your final grade will be calculated as follows:

Component	Total Value
Quizzes (9 best)	<b>40%</b>
Exams (4)	<b>60%</b>

Mathematics Department Grade Scale:

Grade	F	D	D+	C	C+	B	B+	A
Percentage	0-59	60-69	67-69	70-76	77-79	80-86	87-89	90-100

## SEMESTER SCHEDULE

An updated schedule will be maintained on Blackboard in the case of any changes.

N: No one attends class      A: A group attends      B: B group attends

Monday	Tuesday	Wednesday	Friday
<b>Jan 25 - N</b> Class Intro, Overview	<b>Jan 26 - B</b> 0.1: Functions	<b>Jan 27 - A</b> 0.2: New Functions from Old	<b>Jan 29 - B Practice Quiz Due</b> 0.3: Families of Functions
<b>Feb 1 - A</b> 0.4: Inverse Functions	<b>Feb 2 - B</b> 0.5: Exp and Log Functions	<b>Feb 3 - A</b> 1.1: Limits, An Intuitive Approach	<b>Feb 5 - B Quiz</b> 1.2: Computing Limits
<b>Feb 8 - A</b> 1.3: Limits at Infinity	<b>Feb 9 - B</b> 1.3: Limits at Infinity	<b>Feb 10 - A</b> 1.5: Continuity	<b>Feb 12 - B Quiz</b> 1.5: Continuity
<b>Feb 15 - A</b> 1.6: Continuity of Trig, Exp, and Inverse	<b>Feb 16 - B</b> Review Day	<i>Feb 17</i> <i>Break</i>	<b>Feb 19 - N</b> <b>Exam 1</b>
<b>Feb 22 - A</b> 2.1: Tangent Lines and Rates of Change	<b>Feb 23 - B</b> 2.2: The Derivative Function	<b>Feb 24 - A</b> 2.2: The Derivative Function	<b>Feb 26 - B Quiz</b> 2.3: Intro to Differentiation Techniques
<b>Mar 1 - A</b> 2.4: The Product and Quotient Rules	<b>Mar 2 - B</b> 2.5: Derivatives of Trig Functions	<b>Mar 3 - A</b> 2.6: The Chain Rule	<b>Mar 5 - B Quiz</b> 3.1: Implicit Differentiation
<b>Mar 8 - A</b> 3.1: Implicit Differentiation	<b>Mar 9 - B</b> 3.2: Derivatives of Log Functions	<b>Mar 10 - A</b> 3.3: Exp and Inverse Trig Functions	<b>Mar 12 - B Quiz</b> 3.4: Related Rates
<b>Mar 15 - A</b> 3.4: Related Rates	<i>Mar 16 - N</i> <i>Advising Day</i>	<b>Mar 17 - A</b> Review Day	<b>Mar 19 - N</b> <b>Exam 2</b>
<b>Mar 22 - A</b> 3.5: Local Linear Approximation	<b>Mar 23 - B</b> 3.6: l'Hopital's Rule, Indeterminate Forms	<b>Mar 24 - A</b> 4.1: Increase, Decrease, Concavity	<b>Mar 26 - B Quiz</b> 4.2: Relative Extrema, Graphing Polynomials
<b>Mar 29 - A</b> 4.2: Relative Extrema, Graphing Polynomials	<b>Mar 30 - B</b> 4.3: Rational Functions	<b>Mar 31 - A</b> 4.3: Rational Functions	<b>Apr 2 - B Quiz</b> 4.4: Absolute Extrema
<b>Apr 5 - A</b> 4.4: Absolute Extrema	<b>Apr 6 - B</b> 4.5: Applied Min/Max Problems	<i>Apr 7</i> <i>Break</i>	<b>Apr 9 - B Quiz</b> 4.5: Applied Min/Max Problems
<b>Apr 12 - A</b> 4.6: Rectilinear Motion	<b>Apr 13 - B</b> 4.8: Rolle's and Mean Value Theorems	<b>Apr 14 - A</b> Review Day	<b>Apr 16 - N</b> <b>Exam 3</b>
<b>Apr 19 - A</b> 5.1: An Overview of the Area Problem	<b>Apr 20 - B</b> 5.2: The Indefinite Integral	<b>Apr 21 - A</b> 5.3: Integration by Substitution	<b>Apr 23 - B Quiz</b> 5.3: Integration by Substitution
<b>Apr 26 - A</b> 5.5: The Definite Integral	<b>Apr 27 - B</b> 5.6: The Fundamental Theorem of Calculus	<b>Apr 28 - A</b> 5.9: Definite Integrals by Substitution	<b>Apr 30 - B Quiz</b> 5.9: Definite Integrals by Substitution
<b>May 3 - A</b> Integration Review	<b>May 4 - B</b> Review Day	<b>May 5 - N</b> <b>Exam 4</b>	<i>May 7</i> <i>Reading Day</i>

## HOMEWORK LIST

Your homework will not be collected, but these problems (and similar questions) are likely to appear on quizzes and exams. Answers to most of the questions are available in the back of the textbook. Working on additional problems is highly recommended.

Section	Page	Problems
0.1	12	1, 3, 5, 7, 9, 15, 19, 23, 27, 29, 31a-c
0.2	24	1, 3, 5, 11, 13, 17, 25, 27, 29, 31, 33, 35, 39, 41, 49, 53, 61, 63
0.3	35	1, 3, 11, 15, 17, 19, 25, 29, 31
0.4	49	1, 3, 5, 9, 13, 17, 19, 25, 27, 31, 39, 41
0.5	61	1, 5, 9, 11, 13, 15, 17, 21, 23, 25, 27, 47, 57
1.1	77	1, 3, 5, 7, 9, 17-20, 21, 23, 25, 31
1.2	87	1, 3, 7, 11, 13, 15, 19, 21, 25, 31
1.3	96	1, 3, 5, 9, 13, 15, 21, 31, 33, 37, 43
1.4	106	You are not responsible for this section (but try #17 and #21 anyway!)
1.5	118	1, 3, 5, 7, 11, 13, 17, 21, 29, 31, 35, 45, 47
1.6	125	1, 7, 9, 13, 17, 19, 21, 23, 27, 31, 37, 49, 67
2.1	141	3, 11, 13, 15, 17, 23
2.2	152	1, 3, 7, 9, 11, 21, 23, 25, 29
2.3	161	1, 3, 5, 7, 9, 13, 15, 17, 21, 23, 29, 37, 39, 41, 43, 45, 49
2.4	168	1, 3, 5, 7, 11, 13, 19, 21, 23, 27, 29, 31, 33, 39
2.5	172	1, 5, 11, 15, 17, 21, 23, 27, 29, 31
2.6	178	3, 7, 9, 11, 15, 17, 19, 23, 27, 35, 37, 39, 45, 49, 51, 53, 77
3.1	190	3, 5, 7, 9, 11, 13, 15, 17, 27
3.2	195	1, 3, 7, 9, 13, 19, 23, 25, 27, 35, 37, 41
3.3	201	15, 17, 19, 21, 23, 25, 37, 43, 51, 65
3.4	208	1, 5, 13, 15, 17, 19, 25, 27
3.5	217	3, 5, 7, 23, 25, 29, 31, 43
3.6	226	1, 7, 9, 11, 13, 17, 21, 23, 27, 29, 33, 57
4.1	241	1, 5, 7, 9, 15, 17, 19, 21, 25, 29, 39
4.2	252	3, 5, 7, 9, 11, 19, 25, 27, 29, 33, 37, 41, 43, 45, 53
4.3	264	1, 3, 5, 9, 13, 19, 23, 25, 31
4.4	272	3, 7, 9, 11, 13, 21, 23, 25, 27, 31, 33
4.5	283	3, 5, 13, 19, 21, 23, 27, 29, 31, 37, 55
4.6	294	1, 3, 13, 17, 19, 33
4.8	308	1, 3, 5, 7, 15, 25, 41
5.1	321	7, 9, 13, 15, 17
5.2	330	5, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 43, 45
5.3	338	1, 3, 7, 9, 11, 15, 17, 21, 23, 27, 31, 33, 39, 41, 47, 53, 55, 61, 69, 71
5.5	360	13, 15, 19, 21, 23, 25, 33
5.6	373	7, 9, 13, 15, 17, 19, 23, 29, 31, 59, 61
5.9	393	1, 5, 9, 15, 17, 19, 21, 31, 33, 35, 37, 43, 45, 49, 53

## MOODLE



Moodle is a Learning Management System, similar to Blackboard, that allows for flexible mathematics based quizzes. We will be using Moodle for all quizzes and for additional course resources. There is no fee for using Moodle.

### Accessing Moodle

At the beginning of the semester, you will receive an email (delivered to your Mercyhurst email address) with information on enrolling in the Moodle course. You will be required to create a password. Be sure to keep this password safe, and do not share your login information with other students in the course. There is a mobile app available for Moodle, but it is not recommended for use in this course. A computer (desktop or laptop) or tablet is strongly preferred, using the Moodle website as opposed to the app. If you already have a Moodle account and would like to use it rather than the new one generated for you, just let me know. You can link the course to any existing account.

### Question Styles

The quizzes and exams you'll take on Moodle are based on homework problems from the textbook. Some questions are multiple choice, and others will require you to enter a numerical answer. When necessary, specific instructions will be provided with a question. Questions will be asked one at a time, so you can focus on each individual question as you work.

### Time Restrictions

You will be required to finish each quiz within 90 minutes. Any work you have completed will be submitted at the end of this period, even if you have not finished the assessment.

### Availability Windows

Each quiz can only be submitted during its availability window. You will have a 24 hour period, from 12 am until 12 pm, in which to complete the quiz on the dates in this syllabus.

Please note that once you begin a quiz, you will be required to complete it within the given time period or before the end of the availability window, whichever comes first. For instance, if you begin a quiz at 11 pm, you will only have 1 hour to finish. Be sure to allow yourself enough time to finish each assessment before you begin.

### Grades

Your quiz grades will be available immediately. Correct answers and detailed solutions will be available the day after the quiz is available. Grades will be transferred to Blackboard so you can keep track of your overall progress in the class.

### Technical Support

The Moodle website has a support page with answers to many common questions:

<https://support.moodle.com/hc/en-us>.

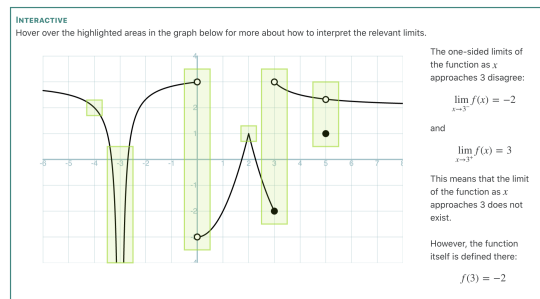
If you have questions or issues with the course itself, or if you encounter any problems with a quiz, please notify me as soon as possible.

## COURSE RESOURCES

There is a variety of materials created specifically for this class to help you succeed:

### Interactive Notes

For every section of the textbook, you'll find additional examples, illustrations, and interactive applets to help clarify the material and see how the mathematics works. These notes, available only on the Moodle course site, are best viewed using a web browser on a computer or tablet, though a smartphone will work too. Unfortunately, these notes are not supported on Blackboard.



Interactive explanation of limits, Section 1.1

### PDF Notes

If you'd prefer to read notes in print or download them to read later, there are also notes for every section available as a PDF. While there is some overlap with the examples and comments in the interactive notes, there are usually additional examples to read though in these PDFs as well. These notes will be available on Moodle and Blackboard.

#### Videos

##### Inverses of Functions

- Definition of inverse
- Inverse notation explained
- The Horizontal Line Test
- Method of finding inverses
- Example: Find the inverse of  $f(x) = 8x^3 - 3$

##### Relationship Between a Function and its Inverse

- Finding properties of an inverse from the function
- Graphs of inverses

##### Inverse Trig Functions

- Restricting domains
- Simplifying inverse trig expressions with right triangles
- Example: Find an expression equivalent to  $\sin(\cos^{-1} x)$

##### More Examples

- Find  $f^{-1}(x)$  if  $f(x) = \sqrt[3]{x+8}$
- Find  $f^{-1}(x)$  if  $f(x) = \frac{x}{x-5}$
- Find the exact value of  $\sin(\sin^{-1}(0.83))$
- Find the exact value of  $\tan^{-1}(\tan(1.891))$
- Let  $f(x) = 5x^3 + 3x + 2$ . Find  $x$  if  $f^{-1}(x) = -1$

Video menu for Section 0.4

### Videos

Every section will also include several videos, each approximately 10-15 minutes in length. An index of videos for each section, including the topics and examples covered in each, is also available to help you find the resource. The video topics cover important theorems and definitions, along with explanations on how to approach most of the homework problems you'll encounter in the class. These videos will be available on Moodle and Blackboard.

## HOMEWORK

A list of all recommended homework problems from the textbook is included in this syllabus. While your work for these problems will not be collected, practicing the material as much as possible is the best (and only) way to learn it. You are strongly encouraged to work through additional problems as well.

If you're stuck on a homework problem, please let me know! I can help in class, via email, or in office hours, and I'd be happy to create additional notes or videos to explain a tricky problem or topic.

## UNIVERSITY RESOURCES AND POLICIES

### ADA Accommodations/Academic Support

Mercyhurst University is committed to making reasonable accommodations for qualified students, and employees with disabilities as required by law. Please refer to the HUB <https://lakersmercyhurst.sharepoint.com/sites/StudentsHub> and select the Services tab, then ADA Accommodations from the dropdown for instructions to request an accommodation. You may also contact Susan Reddinger, ADA Coordinator, [ADA@mercyhurst.edu](mailto:ADA@mercyhurst.edu), 814-824-2362, Egan Hall 200. For students with questions about Academic Support, please refer to the HUB <https://lakersmercyhurst.sharepoint.com/sites/StudentsHub> and select the Academic Resources tab, then Academic Support for more information.

### TITLE IX Sexual Misconduct/Sexual Harassment Reporting

Mercyhurst is committed to providing an environment free from sex discrimination, including sexual harassment and sexual violence. Please refer to the HUB <https://lakersmercyhurst.sharepoint.com/sites/StudentsHub> and select the Resources tab, then Title IX – Sexual Respect from the dropdown for more information. If you would like to file a sexual misconduct complaint, please contact Dr. Laura Zirkle, Interim Title IX Coordinator and VP for Student Life, [titleix@mercyhurst.edu](mailto:titleix@mercyhurst.edu), 814-824-2362, Egan Hall 314. Please be aware that in compliance with Title IX, educators must report incidents of sexual assault/harassment, stalking, and domestic/dating violence. If you disclose any of these situations in class, in papers, or to me personally, I am required to report it to the Title IX Coordinator (or any of the Deputy Title IX Coordinators).

### Academic Honesty

Students are required to uphold academic integrity throughout the course. In particular, the use of unauthorized materials or collaboration on quizzes or exams and other incidences of academic dishonesty will be handled according to the policies set forth in the Student Handbook.

### Course Evaluations

Near the end of the semester, you will be asked to complete an online course evaluation. The evaluation will be completed in class during the last two weeks of the semester using any laptop, tablet, or mobile device. The response tool allows you to note aspects of the course that helped you learn, as well as aspects that might be modified to help future students learn more effectively. You will receive an email letting you know when the evaluation window for our class is open. Please note that these course evaluations are anonymous and instructors do not see the results until after the grades for the course are submitted.



## COVID-19 INFORMATION

This is sure to be an unprecedented semester! While we cannot know what the next few months will bring, we must all work together to keep our campus community safe and healthy. This page features information regarding policies of the University (in italics) as well as comments, suggestions, and requests that pertain to our class specifically.

### A/B Meeting Schedule

*As our class exceeds the maximum recommended capacity of our classroom under social distancing guidelines, we will be following the A/B schedule for our class meetings. This means that only half of you will attend in person classes each day, with the rest of you attending virtually through a live Zoom meeting. A schedule will be posted on Blackboard before the start of the semester indicating which group you're in and what days you should plan to come to the classroom.*

### Face Masks

*As per the COVID-19 Prevention, Mitigation, and Response Policy, Mercyhurst University is requiring that all members of the campus community wear a cloth or disposable face covering over their nose and mouth when on campus. Please refer to the policy for specific details as to where and when face coverings are required. Students may use their own face coverings or those provided by the University. A student in need of a face covering should email [covid19@mercyhurst.edu](mailto:covid19@mercyhurst.edu) or call 814-824-3600 to find the nearest location where face coverings are available. The University's Mask/Face Coverings Policy will be enforced in this class.*

### Sanitation and Safety

*In keeping with the COVID-19 Prevention, Mitigation, and Response Policy, students are expected to use hand sanitizer and to wipe down their desks using disinfectant wipes when they enter and exit the classroom. Classrooms have been provided with sanitizer and disinfectant wipes for student and faculty use.*

### Eating and Drinking in the Classroom

*In light of the COVID-19 situation, Eating is not permitted in classrooms, labs, or other academic spaces. A water bottle or cup with a lid, and straw preferably, is permitted to be used in classrooms and labs to help prevent a student from becoming uncomfortably parched. Masks should be pulled only slightly away from the bottom of the face to take a quick drink and immediately replaced to covering the mouth and nose.*

### Class Dismissal and Congestion Prevention

*In keeping with the COVID-19 Prevention, Mitigation, and Response Policy, faculty members and students should take steps to avoid crowding outside of classrooms, in hallways, and any enclosed area in university buildings. All rooms will be designated with signs indicating maximum capacity for specific instructional use. These must always be adhered to. Students waiting to enter classrooms or exiting classrooms should always maintain a minimum of 6 feet of distance from others. Class time endings may be adjusted when necessary to minimize overcrowding or congestion.*

## COVID-19 INFORMATION, CONTINUED

### Seating Chart

*In compliance with federal and state regulations, the University must be able to conduct contact tracing if there is a positive test or an outbreak; therefore, seating charts are mandatory for all in-person classes. Students will be required to sit in the same seat in the classroom each time they attend class. The seating chart will be available for review for purposes of contact tracing.*

### Paper Sharing Policy

We will not be exchanging paper this semester. Supplemental materials will be distributed and made available electronically. Assignments and exams will be submitted electronically as well. You are welcome to bring your own paper to class to take notes, but you may not pass paper to a classmate or to me.

### Attendance and Missed Classes

*Attendance at all classes is expected. However, it is important that students and course instructors adhere to the university's COVID-19 mitigation policies and strategies. As such, a student who misses class due to illness or suspected illness within the context of those policies will not be penalized and will be provided sufficient means to make up any missed course content or work and remain actively engaged in the class.*

The word "attendance" has a broader definition than usual this semester. While attending class is preferred, please do not feel obligated to come if you are feeling ill. You are free to join and participate in the live Zoom meeting in lieu of attending a class meeting, regardless of your A/B schedule. If you're not up to joining in, please watch the recording of the class meeting and the associated video lectures when you're able to.

If you are unable to attend class (or join the live Zoom meeting) for more than a few days, please let me know as soon as possible. I am happy to work with you in building a plan that allows you the time off you need without risking your academic progress.

### Potential Class Changes

It is my hope that we remain able to meet in person as scheduled for the entire semester. However, there is a very good chance that our plans will change, and without much notice.

If we are unable to continue meeting in person, you will still have the opportunity to "attend" class via Zoom during our regularly scheduled times. The course content on Blackboard was created to help fill in any unexpected gaps in meetings or attendance.

Our highest priority is to remain healthy and safe. We will all need to remain responsible, flexible, and understanding to make this semester a success, and I have full confidence that we will be able to achieve that goal.