Math 170

Calculus I

Fall 2020

Section 01

MTWF

8:00 - 8:50 am

Hirt 209

Instructor

Dr. Lauren Williams

Old Main 404

lwilliams@mercyhurst.edu

(814) 824-2226

Office Hours

Monday 10:00 - 11:00

Tuesday 3:00 - 4:00

Wednesday 12:00 - 12:45

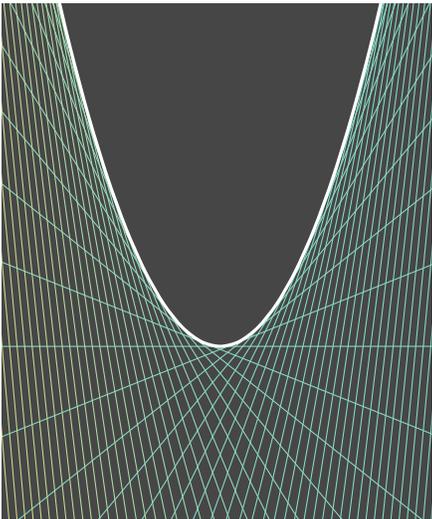Thursday 9:00 - 9:30

Thursday 2:00 - 3:30

and by appointment

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:
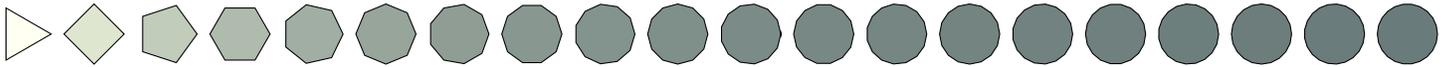
- recognize, define, and apply properties of functions, such as their domain, range, intercepts, and inverses;
- be able to evaluate a variety of limits;
- identify discontinuities of a function presented either graphically or algebraically;
- find the derivative of functions using the limit definition;
- 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.

Course Website: http://integral-domain.org/lwilliams/Math170/

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 Monday, August 26th. **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.

Office Hours

For the Fall 2020 semester, I will be unable to meet with students in my office. Office hours will be conducted via Zoom. As always, your presence at office hours is welcome but optional.

Required Materials
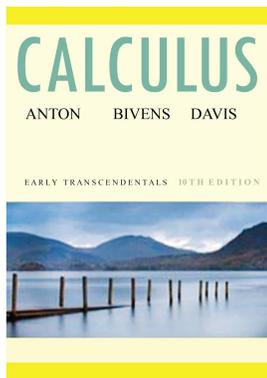
Textbook

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.

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.
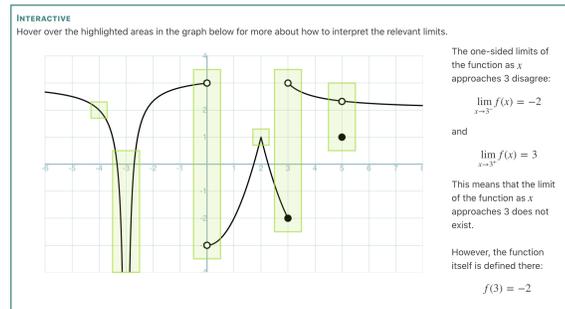
Interactive explanation of limits, Section 1.1

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 $f(x) = \dfrac{x}{x - 5}$
- 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.

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 11 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 10 quiz grades will be counted towards your final grade).

The quizzes will be available for a 24 hour period (midnight to midnight) on Moodle as shown in the course schedule. You'll know your quiz grade as soon as you're finished with it, but the correct answers will not be visible until the quiz has closed.

Though the quizzes will be taken online, most questions will not be multiple choice and will require you to enter a number or a function as your answer. Before you can get started with a graded quiz, you'll need to complete a Quiz Tutorial on Moodle. This ungraded quiz (that will not test your mathematical knowledge) will help you get acquainted with the quiz layout and how to enter your responses.

You will have 90 minutes to complete each quiz from the time you begin, so please be sure that you allow time to finish a quiz before starting. You can sign off and return to Moodle after starting a quiz, but your time will end after 90 minutes from when you first accessed the quiz. You will only have one chance to take each quiz, and will not be able to change your responses after submitting. You will not be required to submit any written work for your quizzes.

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.

Grades

Your final grade will be calculated as follows:

Component	Value	Total Points
Quizzes (10 best)	18 points each	**180 points**
Exams (4)	80 points each	**320 points**
		500 points

Your letter grade will be based on the total number of points you earn throughout the semester:

Grade	Percentage	Points Needed
A	90	**448**
B+	87	**433**
B	80	**398**
C+	77	**383**
C	70	**348**
D+	67	**333**
D	60	**298**

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 and 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.

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, or any other utilities.
- ask for help or clarification on an exam from a classmate, friend, family member, online service, 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.

ADA and Learning Differences

Mercyhurst University is committed to making reasonable accommodations for qualified students, and employees with disabilities as required by law. Individuals seeking an accommodation for a disability must submit a written request outlining the specific accommodation request being made. Supporting documentation may also be required. To request an accommodation, contact Alice Agnew, Director of Equal Opportunity Programs, 311 Egan Hall, aagnew@mercyhurst.edu, 814-824-2362.

Title IX Information

Mercyhurst is committed to providing an environment free from sex discrimination, including sexual harassment and sexual violence. Please refer to the Title IX – Sexual Respect button on the HUB for more information. If you would like to file a sexual misconduct complaint, please contact Mercyhurst Title IX Coordinator Alice Agnew, 311 Egan Hall, aagnew@mercyhurst.edu, 814-824-2362. 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, plagiarism of any sort, unauthorized collaboration on exams, quizzes and other assignments, 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.

SEMESTER SCHEDULE

IMPORTANT NOTE FOR FALL 2020:

Due to the current COVID-19 pandemic, it is more likely than usual that our semester plans will be altered. While I will attempt to follow this schedule as closely as possible, please make a note of any announced changes to important dates in class or on Blackboard.

Monday	Tuesday	Wednesday	Friday
		Aug 19 Class Intro, Overview	**Aug 21** 0.1, 0.2: Functions, New Functions from Old
Aug 24 0.3: Families of Functions	**Aug 25** Quiz 0.4: Inverse Functions	**Aug 26** 0.5: Exp and Log Functions	**Aug 28** 1.1: Limits, An Intuitive Approach
Aug 31 *Add/Drop Deadline* 1.2: Computing Limits	**Sep 1** Quiz 1.3: Limits at Infinity	**Sep 2** 1.3: Limits at Infinity	**Sep 4** 1.5: Continuity
Sep 7 1.5: Continuity	**Sep 8** Quiz 1.6: Continuity of Trig, Exp, and Inverse	**Sep 9** 1.6: Continuity of Trig, Exp, and Inverse	**Sep 11** 2.1: Tangent Lines and Rates of Change
Sep 14 Review Day	**Sep 15** Exam I	**Sep 16** 2.2: The Derivative Function	**Sep 18** 2.2: The Derivative Function
Sep 21 2.3: Intro to Differentiation Techniques	**Sep 22** Quiz 2.4: The Product and Quotient Rules	**Sep 23** 2.5: Derivatives of Trig Functions	**Sep 25** 2.6: The Chain Rule
Sep 28 3.1: Implicit Differentiation	**Sep 29** Quiz 3.1: Implicit Differentiation	**Sep 30** 3.2: Derivatives of Log Functions	**Oct 2** 3.3: Exp and Inverse Trig Functions
Oct 5 3.3: Exp and Inverse Trig Functions	**Oct 6** Quiz 3.4: Related Rates	**Oct 7** 3.4: Related Rates	**Oct 9** 3.5: Local Linear Approximation
Oct 12 Review Day	**Oct 13** Exam II	**Oct 14** 3.6: l'Hopital's Rule, Indeterminate Forms	**Oct 16** 3.6: l'Hopital's Rule, Indeterminate Forms
Oct 19 4.1: Increase, Decrease, Concavity	**Oct 20** Quiz 4.2: Relative Extrema, Graphing Polynomials	**Oct 21** 4.2: Relative Extrema, Graphing Polynomials	**Oct 23** 4.3: Rational Functions
Oct 26 4.4: Absolute Extrema	**Oct 27** Quiz 4.5: Applied Min/Max Problems	**Oct 28** 4.5: Applied Min/Max Problems	**Oct 30** 4.6: Rectilinear Motion
Nov 2 Review Day	**Nov 3** *Advising Day* Exam III	**Nov 4** 4.8: Rolle's and Mean Value Theorems	**Nov 6** 5.1: An Overview of the Area Problem
Nov 9 5.2: The Definite Integral	**Nov 10** Quiz 5.3: Integration by Substitution	**Nov 11** 5.3: Integration by Substitution	**Nov 13** 5.5: The Definite Integral
Nov 16 5.6: The Fundamental Theorem of Calculus	**Nov 17** Quiz 5.9: Definite Integrals by Substitution	**Nov 18** 5.9: Definite Integrals by Substitution	**Nov 20** Integration Review
Nov 23 Quiz Review Day	**Nov 24** Exam IV	*Nov 25* *Thanksgiving Break*	*Nov 27* *Thanksgiving Break*

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.

Sec.	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

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. You will be divided into two groups that will alternate: half of you will come to the classroom on Monday and Wednesday, and the other half will come on Tuesday and Friday.

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 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.

I will have a few disposable masks with me in case you need to borrow one, but please understand that these supplies are limited.

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, 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, Missed Class

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 certainly 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 (even above learning about determinants and vector spaces) 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.