Calculus I

Meeting Information

Meeting Times	MTWF 8:00 - 8:50 (4 credits)
Location	Hirt 209
Website	math.mercyhurst.edu/~lwilliams/math170
Prerequisite(s)	Placement Score 76 or higher, or Math 118, or Math 111 and Math 112, or equivalent

Instructor	Lauren Williams, PhD
Email	lwilliams@mercyhurst.edu
Office Phone	(814) 824-2226
Office	Old Main 404
Office Hours	Mon 9:00 - 10:00, 1:00 - 2:00
	Tues 11:30 - 12:30
	Wed 11:00 - 11:45
	Thurs 8:30 - 9:15
	Fri 9:00 - 11:00

Grading

60%	**Midterm Exam Average**
20%	**Final Exam**
20%	**Quiz Average (1 lowest dropped)**

A	B+	B	C+	C	D+	D
90	87	80	77	70	67	60

Important Dates

Jan	16	First Class Meeting
	19	Last Day to Add/Drop
Feb	9	Exam I
Mar	2	Exam II
	5-9	Spring Break, No Class
	30	Easter Break, No Class
Apr	2	Easter Break, No Class
	6	Exam III
	10	Advising Day, No Class
	20	Last Day to Withdraw
May	2	Exam IV
	9	Final Exam 8:00 - 10:00

Required Materials

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.

Course Calendar

Jan	16	Class Intro, Overview	
	17	0.1, 0.2: Functions, New Functions from Old	
	19	0.3: Families of Functions	
	22	0.4: Inverse Functions	
	23	0.5: Exp and Log Functions	
	24	1.1: Limits, An Intuitive Approach	Quiz
	26	1.2: Computing Limits	
	29	1.2: Computing Limits	
	30	1.3: Limits at Infinity	
	31	1.3: Limits at Infinity	Quiz
Feb	2	1.5: Continuity	
	5	1.5: Continuity	
	6	1.6: Continuity of Trig, Exp, and Inverse	
	7	Review	
	9	Exam I	
	12	2.1: Tangent Lines and Rates of Change	
	13	2.2: The Derivative Function	
	14	2.2: The Derivative Function	
	16	2.3: Intro to Differentiation Techniques	
	19	2.4: The Product and Quotient Rules	
	20	2.5: Derivatives of Trig Functions	
	21	2.6: The Chain Rule	
	23	Chapter 2 Review	Quiz
	26	3.1: Implicit Differentiation	
	27	3.1: Implicit Differentiation	
	28	Review	
Mar	2	Exam II	
	5-9	Spring Break - No Class	
	12	3.2: Derivatives of Log Functions	
	13	3.3: Exp and Inverse Trig Functions	Quiz
	14	3.4: Related Rates	
	16	3.4: Related Rates	
	19	3.6: l'Hopital's Rule, Indeterminate Forms	
	20	3.6: l'Hopital's Rule, Indeterminate Forms	
	21	Chapter 3 Review	Quiz
	23	4.1: Increase, Decrease, Concavity	
	26	4.2: Relative Extrema, Graphing Polynomials	
	27	4.2: Relative Extrema, Graphing Polynomials	
	28	4.3: Rational Functions	
	30	Easter Break - No Class	
Apr	2	Easter Break - No Class	
	3	4.3: Rational Functions	
	4	Review	
	6	Exam III	
	9	4.4: Absolute Extrema	
	10	Advising Day - No Class	
	11	4.5: Applied Min/Max Problems	
	13	4.5: Applied Min/Max Problems	
	16	4.6: Rectilinear Motion	
	17	4.8: Rolle's and Mean Value Theorems	
	18	5.1: Overview of Area Problem	
	20	5.2: The Definite Integral	
	23	5.3: Integration by Substitution	
	24	5.3: Integration by Substitution	Quiz
	25	5.6: The Fundamental Theorem of Calculus	
	27	5.7: Rectilinear Motion, 5.9: Def Int By Sub	
	30	5.9: Definite Integrals by Substitution	
May	1	Review	
	2	Exam IV	
	4	Review, Last Class Meeting	
	9	Final Exam 8 - 10	

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 should be able to:
- recognize, define, and apply properties of functions, such as their domain and range, intercepts, and inverses.
- have an intuitive understanding of a limit, and 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 polynomials and rational 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.
- read and interpret mathematical theorems, including checking that hypotheses are satisfied and reaching correct conclusions.

Class Policies and Suggestions

- Attendance is not required, but is highly recommended. If you have to miss class, read the relevant section of the textbook and try the suggested problems, and ask a classmate for notes and information you may have missed. I do not keep detailed lecture notes for this course.
- I will attempt to return emails as quickly as possible (within 24 hours). However, it is better to ask complicated questions during class or in office hours. If you have a question about the homework, it is quite likely someone else has the same question, so you're doing the class a favor by asking.
- There are other calculus textbooks available in the library and in my office. Due to book prices, you may not want to invest in a second book, but it can be helpful to have alternate sources or see topics explained in other ways.
- I do not have a "no electronics" policy, but please remember to mute all devices during lecture, and use devices in a way that does not distract other students in the class.
- You will be allowed to listen to music (with headphones) during exams, but please keep the volume at a level that does not distract other students. Plan a playlist in advance - your phone/player will need to be kept face down on the desk throughout the exam.
- While you are encouraged to work together on the homework, be sure you understand all material on your own before a quiz or exam.

Quizzes

You will be given quizzes on the material regularly. Keeping up with the suggested textbook homework will ensure that you are prepared for the quizzes, which will feature problems very similar to those in the homework. The dates for quizzes is provided in the course schedule; note that exact topics covered on a quiz is subject to change. Any changes will be announced in class.

Make up quizzes will only be given for excused absences. **All make ups must be completed before the graded quizzes are returned to the class; this will typically be the next class meeting.** Your lowest quiz grade will be dropped when calculating your final grade, including a missed quiz.

Quiz grades will not be based strictly on whether or not you found the correct answer. Your work must also be written clearly, and with proper notation, to receive full credit.

Exams

There will be four midterm exams given throughout the semester, in addition to the final exam. The material on the exams will be similar to topics covered on quizzes and homework. You will be given review guides for each exam. All exams are cumulative; each exam will include some material from the previous exams. Mathematics is a cumulative effort, and mastering each topic is only possible if you have mastered earlier concepts.

All midterm exams will be written for a 50 minute class meeting. If you would like additional time on an exam, you may arrive at our usual classroom anytime after 7 am to get started. Additional time will not be given after the end of the normal class period.

Your lowest exam grade (including a missed exam) will be replaced by your final exam grade, if your final exam grade is better. A second missed exam will receive a grade of 0, so please check your schedules carefully and ensure that you can attend all exams.

Except in the case of illness or emergency, you are expected to let me know that you will miss an exam *before* the scheduled exam day. If you need to miss class during a scheduled exam for a documented, excused reason (illness, family emergency, athletics), you will generally be able to make up the exam as long as I am notified in advance.

The final exam will be cumulative, and is scheduled for Wednesday, May 9, 8:00 - 10:00 am.

Homework

When we finish a section in the book, you should immediately begin working on the homework problems from the list attached.

Your work will not be collected. However, actually working through these problems is the key to your success in this class. Attending every class is not enough; mathematics can only be learned through practice. You should plan to spend a significant amount of time on the homework. It is expected that you spend approximately 8-12 hours per week studying the material outside our class meetings, according the the typical 2-3 hour per credit rule of thumb.

Stay up to date with homework, and get help if you cannot understand a problem after trying it on your own. Do not ignore a problem that you are struggling with. If you are having trouble with a topic, please come talk to me during office hours, ask questions in class, seek help from a classmate, or go to the department tutors for assistance. You are expected to try to work on all problems on your own first; when coming to my office, be prepared to show me what you've already tried.

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.

TUTORING

The Department of Mathematics offers free tutoring for Calculus I students in Zurn 213. No appointments are needed, just drop by on Monday, Tuesday, or Thursday evening between 6 and 8 pm. You are free to ask tutors questions on any assigned homework and exam review sheets.

ADDITIONAL RESOURCES

- **Khan Academy Calculus**
  https://www.khanacademy.org/math/calculus-home
  Includes videos and practice problems for all material covered in this course.
- **MIT OpenCourseWare Calculus**
  http://ocw.mit.edu/courses/mathematics/18-01sc-single-variable-calculus-fall-2010/
  Includes videos, lecture notes, practice problems and solutions for all material covered in this course.
- **Wolfram Alpha**
  http://www.wolframalpha.com
  A great way to check your work. Free, with subscription available to access step-by-step solutions to problems.
- **Calculus in Context Textbook**
  http://www.math.smith.edu/Local/cicintro/
  Free textbook by David Cox, Donal O'Shea, Harriet Pollatsek, and Lester Senechal
- **Single Variable Calculus Textbook**
  https://www.whitman.edu/mathematics/calculus/calculus.pdf
  Free textbook by David Guichard

LEARNING DIFFERENCES

In keeping with college policy, any student with a disability who needs academic accommodations must call Learning Differences Program secretary at 824-3017, to arrange a confidential appointment with the director of the Learning Differences Program during the first week of classes.

MERCY MISSION

This course supports the mission of Mercyhurst University by creating students who are intellectually creative. Students will foster this creativity by: applying critical thinking and qualitative reasoning techniques to new disciplines; developing, analyzing, and synthesizing scientific ideas; and engaging in innovative problem solving strategies.

SUGGESTED HOMEWORK PROBLEMS

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
1.5	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
5.7	381	1, 3, 5, 7, 31, 39
5.9	393	1, 5, 9, 15, 17, 19, 21, 31, 33, 35, 37, 43, 45, 49, 53

Solutions to most questions are in the textbook. Try the similar even numbered problems for more practice.