

# CALCULUS WITH APPLICATIONS TO BUSINESS AND FINANCE

The University of Toledo  
Mathematics & Statistics Department, College of Natural Sciences and Mathematics  
MATH1730-0XX, CRN XXXXX

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<b>Instructor:</b>	(Insert Name]	<b>Class Location:</b>	(Insert Building/Room)
<b>Email:</b>	(Insert E-mail Address)	<b>Class Day/Time:</b>	(Insert Days/Time)
<b>Office Hours:</b>	(Insert Days/Time)	<b>Lab Location:</b>	(Insert Building/Office #, if applicable)
<b>Office Location:</b>	(Insert Building/Office Number)	<b>Lab Day/Time:</b>	(Insert Days/Time, if applicable)
<b>Office Phone:</b>	(Insert Phone Number)	<b>Credit Hours:</b>	5
<b>Term:</b>	(Insert Semester and Year)		

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## COURSE DESCRIPTION

An introduction to differential and integral calculus. Topics include limits, derivatives, maxima/minima, indefinite and definite integrals with an emphasis on business applications and technology use.

## STUDENT LEARNING OUTCOMES

The successful Math 1730 student should be able to apply the following competencies to a wide range of functions, including piecewise, polynomial, rational, algebraic, exponential and logarithmic.

1. Determine limits and discontinuities of functions.
  - **Limits:** Determine limits analytically, numerically and graphically including one-sided limits and limits at infinity.
  - **Continuity:** Analyze the limit behavior of a function at a point in its domain to determine if the function is continuous at that point. Determine intervals in which a function is continuous. Analyze and classify the discontinuities of a function.
2. Compute derivatives.
  - **Derivative Definition:** Use the limit definition of the derivative to determine the existence and to find the derivative of a given function.
  - **Derivative Formulas:** Find the derivative of a function by identifying and applying the appropriate derivative formula.
  - **Higher Order Derivatives:** Find higher order derivatives.
3. Interpret derivatives and apply them to a business environment.
  - **Rates of Change:** Interpret the derivative as a rate of change.
  - **Tangent Lines:** Find the slope of the tangent line to the graph of a function at a given point.
  - **Increasing/Decreasing:** Use the first derivative to determine intervals on which the graph of a function is increasing or decreasing and to determine critical points of the function.
  - **Concavity:** Use the second derivative to determine intervals on which the graph of a function is concave upwards or concave downwards and to determine points of inflection.
  - **Extrema:** Find and classify relative extrema and, on a closed interval, absolute extrema of a function.
  - **Marginal Analysis:** Solve applied problems including marginal analysis applications and explain the relationship between marginal cost and average cost.
  - **Elasticity:** Determine and interpret the elasticity of demand for a product (optional objective)

4. Find indefinite and definite integrals and apply them to business problems.
  - **Anti-derivatives:** Construct anti-derivatives analytically.
  - **Integrals and Substitution:** Find indefinite integrals using integration formulas and the method of substitution.
  - **Integration by Parts:** Find indefinite integrals using integration by parts (optional topic)
  - **Riemann Sums:** Estimate the numerical value of a definite integral using a Riemann sum (optional topic)
  - **Definite Integrals:** Use the Fundamental Theorem of Calculus to evaluate definite integrals,
  - **Areas:** Identify definite integrals of functions as the areas of regions between the graph of the function and the x-axis, and use definite integrals to calculate the area of the region under a curve and the area of the region between two curves.
  - **Continuous Compound Interest:** Determine present value and future value for an investment with interest compounded continuously. Determine the average value of a function on an interval (optional topic)
  - **Consumer/Producer Surplus:** For given supply and demand functions find and interpret the consumer's surplus and the producer's surplus.
  - **Improper Integrals:** Evaluate improper integrals and apply to business problems (optional topic)
5. Solve optimization problems using functions of two variables (optional set of objectives)
  - **Partial Derivatives:** Compute partial derivatives of functions of two variables algebraically. (optional objective)
  - **Optimization:** Determine critical points for functions of two variables and use the second derivative test to determine the nature of critical points of a function of two variables. (optional objective)
  - **Lagrange Multipliers:** Use the method of Lagrange multipliers to determine extreme values of functions of two variables subject to constraints. (optional objective)

### **PREREQUISITES**

Minimum grade of C- in either Math 1320 or Math 1340 or College Algebra Placement 15 or ALEKS placement 68 or ACT Math 24 or SAT Mathematics 560 or Math Section Score 580 (new SAT).

**CLASS MEETINGS:** 5 hours per week including lecture, lab, and recitation time.

**TEXTBOOK:** You do not need to purchase anything for this course. The text/course materials will be provided and the cost (\$111.49) is included in your course fees. This course includes an e-text copy of *Calculus and Its Applications, A Custom Edition for the University of Toledo*, by Bittinger, Ellenbogen, and Sargent, along with MyLab Math software.

### **UNIVERSITY POLICIES:**

#### **POLICY STATEMENT ON NON-DISCRIMINATION ON THE BASIS OF DISABILITY (ADA)**

The University is an equal opportunity educational institution. Please read The University's Policy Statement on Nondiscrimination on the Basis of Disability Americans with Disability Act Compliance.

#### **ACADEMIC ACCOMMODATIONS**

The University of Toledo is committed to providing equal access to education for all students. If you have a documented disability or you believe you have a disability and would like information regarding academic accommodations/adjustments in this course please contact the Student Disability Services Office (Rocket Hall 1820; 419.530.4981; studentdisabilitysvs@utoledo.edu) as soon as possible for more

information and/or to initiate the process for accessing academic accommodations. For the full policy see: <http://www.utoledo.edu/offices/student-disability-services/sam/index.html>

## **ACADEMIC POLICIES:**

### **STUDENT PRIVACY**

Federal law and university policy prohibits instructors from discussing a student's grades or class performance with anyone outside of university faculty/staff without the student's written and signed consent. This includes parents and spouses. For details, see the "Confidentiality of student records (FERPA)" section of the University Policy Page at <http://www.utoledo.edu/policies/academic/undergraduate/index.html>

### **MISSED CLASS POLICY**

If circumstances occur in accordance with "The University of Toledo Missed Class Policy" (found at <http://www.utoledo.edu/policies/academic/undergraduate/index.html>) result in a student missing a quiz, test, exam or other graded item, the student must contact the instructor in advance by phone, e-mail or in person, provide official documentation to back up his or her absence, and arrange to make up the missed item as soon as possible.

### **ACADEMIC DISHONESTY**

Any act of academic dishonesty as defined by the University of Toledo policy on academic dishonesty (found at <http://www.utoledo.edu/dl/students/dishonesty.html>) will result in an F in the course or an F on the item in question, subject to the determination of the instructor.

### **GRADING**

Grades will be based on the following scale:

Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
Minimal Percentage Required	93%	90%	87%	83%	80%	77%	73%	70%	67%	63%	60%	<60%

### **ASSESSMENT OF LEARNING**

Student learning will be assessed using graded online and written homework, quizzes, a class participation score, three tests and a final examination. All tests and final exams are written by the department. The final exam is comprehensive and mandatory. Tests, quizzes and the final exam should together comprise 80% of the grade.

### **ATTENDANCE**

Students are expected to attend all classes and recitations from beginning to end and attendance will be tracked.

### **IMPORTANT DATES**

\*The instructor reserves the right to change the content of the course material if he perceives a need due to postponement of class caused by inclement weather, instructor illness, etc., or due to the pace of the course.

### **MIDTERM EXAM:**

### **FINAL EXAM:**

### **OTHER DATES**

The last day to drop this course is: \_\_\_\_\_

The last day to withdraw with a grade of “W” from this course is: \_\_\_\_\_

## STUDENT SUPPORT SERVICES

Free math tutoring on a walk-in basis is available in the **Math Learning and Resources Center** located in Rm B0200 in the lower level of Carlson Library (phone ext 2176). The Center operates on a walk-in basis. MLRC hours can be found at <http://www.math.utoledo.edu/mlrc/MLRC.pdf>

## CLASS SCHEDULE

		Number of Lecture Hours
Chapter R	Functions Graphs and Models	(3 hours)
	R.1 Graphs and Equations	0.5
	R.2 Functions and Models	0.5
	R.3 Finding Domain and Range	0.5
	R.4 Slope and linear functions	0.5
	R.5 Nonlinear Functions and Models	1.0
Chapter 1	Differentiation	(11 hours)
	1.1 Limits: A Numerical and Graphical Approach: <i>Limits</i>	1.5
	1.2 Algebraic Limits and Continuity: <i>Limits, Continuity</i>	1.5
	1.3 Average Rates of Change: <i>Rates of Change</i>	1.5
	1.4 Differentiation Using Limits of Difference Quotients: <i>Rates of Change, Derivative Definition, Tangent Lines</i>	1.5
	1.5 The Power and Sum-Difference Rules: <i>Derivative Formulas</i>	1.5
	1.6 The Product and Quotient Rules: <i>Derivative Formulas</i>	1.5
	1.7 The Chain Rule: <i>Derivative Formulas</i>	1.0
	1.8 Higher-Order Derivatives: <i>Higher Order Derivatives</i>	1.0
Chapter 2	Applications of Differentiation	(8 hours)
	2.1 Using First Derivatives to Find Max and Min Values: <i>Increasing/Decreasing, Extrema</i>	2.0
	2.2 Using Second Derivatives to Find Max and Min Values, <i>Increasing/Decreasing, Extrema, Concavity</i>	2.0
	2.3 Graph Sketching: Asymptotes and Rational Functions: <i>Increasing/Decreasing, Extrema, Concavity</i>	1.0
	2.4 Using Derivatives to Find Absolute Max and Min Values: <i>Extrema</i>	1.0
	2.5 Max-Min Problems: Business and Economic Applications: <i>Extrema</i>	1.5
	2.6 Marginals (Differentials omitted): <i>Marginal Analysis</i>	0.5
	2.7 Elasticity of Demand (optional): <i>Elasticity</i>	
Chapter 3	Exponential and Logarithmic Functions	(5 hours)
	3.1 Exponential Functions: <i>Derivative Formulas</i>	1.0
	3.2 Logarithmic Functions: <i>Derivative Formulas</i>	1.0
	3.3 Applications: Uninhibited and Limited Growth Models: <i>Continuous Compound Interest</i>	1.0

	3.4	Applications: Decay: <i>Continuous Compound Interest</i>	1.0
	3.5	The Derivatives of $a^x$ and $\log_a x$ : <i>Derivative Formulas</i>	1.0
Chapter	4	Integration	(8 hours)
	4.1	Antidifferentiation: <i>Antiderivatives, Integrals and Substitution</i>	2.0
	4.2	Antiderivatives as Areas: <i>Riemann Sums</i>	1.0
	4.3	Area and Definite Integrals: <i>Definite Integrals, Areas</i>	2.0
	4.4	Properties of Definite Integrals: <i>Areas, Average Value</i>	1.5
	4.5	Integration Techniques: Substitution: <i>Integrals and Substitution</i>	1.5
	4.6	Integration Techniques: Integration by Parts (optional): <i>Integration by Parts</i>	
Chapter	5	Applications of Integration	(3 hours)
	5.1	Consumer Surplus and Producer Surplus: <i>Consumer/Producer Surplus</i>	1.5
	5.2	Applications of Integrating Growth and Decay Models: <i>Integrals and Substitution, Continuous Compound Interest</i>	1.5
	5.3	Improper Integrals (optional): <i>Improper Integrals</i>	
Chapter	6	Functions of Several Variables (optional)	
	6.1	Functions of Several Variables (optional)	
	6.2	Partial Derivatives (optional): <i>Partial Derivatives</i>	
	6.3	Maximum-Minimum Problems (optional): <i>Optimization</i>	
	6.5	Constrained Optimization (optional): <i>Lagrange Multipliers</i>	
		Total Number of Lecture Hours	38.0