University at Buffalo

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MTH 141: College Calculus I

Number of Course Credits: 4

Course Description

This is the first part of a 3-semester sequence in calculus for students of mathematics, natural sciences, and engineering. MTH 141 covers Chapters 2-5 of the text.

Required Text(s) & Materials

Calculus: Early Transcendentals, Ninth Edition, James Stewart, Daniel Clegg, Saleem Watson.

Prerequisites

Score of 70 or better on all three components of the Math Readiness Assessment (exam results are valid for one year), or a C or better in ULC148, MTH 108, MTH 114, MTH 115, MTH 121, MTH 131, or D or better in MTH 141, or score of 3 or better on AP Calculus, or concurrent registration in MTH 109 with either C or better in MTH 113 or MRA scores 70+ in Math Fundamentals and 50-69 in Trigonometry and Geometry.

Notes

If you are following the suggested schedule described below remember not to assign problems on log, exp, and inverse trigonometric functions in sections 2.5, 2.7, and 2.8, since these functions are covered only later in the course.

Learning Outcomes

Outcome (Student will be able to...)	Method of Assessment
- Define the limit of a function at a point - Evaluate limits using the definition and using algebraic properties of limits - Evaluate limits of functions at infinity and interpret them as horizontal asymptotes - Define continuity and determine whether or not a function is continuous at a point and on an interval - Define derivative and interpret it as the slope of a tangent to the graph of a function - Recognize exponential, logarithmic, and inverse trigonometric functions, sketch their graphs and use their basic properties in computations - Compute derivatives of polynomial, exponential, logarithmic, trigonometric, and inverse trigonometric functions - Compute derivatives using derivative rules, including the chain rule and implicit differentiation	HW 1, 2, 3 Exam 1 Final Exam
- Use derivatives to compute linear approximations of functions - Find critical points, minima and maxima of a function using its first and second derivatives - Use derivatives to sketch graphs of functions - State the mean value theorem and apply it in computations - Apply L'Hospital's rule to compute limits of functions - Use derivatives to solve optimization problems - Use derivatives to solve practical problems involving rectilinear motion	HW 4, 5, 6 Exam 2 Final Exam
- Find the area of a region bounded by a curve and the x-axis using rectangles and limits. - Find the area of a region bounded by a curve and the x-axis using indefinite integrals and the fundamental theorem of calculus - Use integrals to solve practical problems involving rectilinear motion	HW 7, 8, 9 Final Exam
- Choose appropriate methods or models for a given problem, using information from observation or knowledge of the system being studied.	HW 1, HW 2, HW 3, HW 4, HW 5 HW 6, HW 7, HW 8, HW 9, Exam 1, Exam 2, Final Exam
- Employ quantitative methods, mathematical models, statistics, and/or logic to analyze data and solve real-world problems beyond the level of basic algebra.	HW 1, HW 2, HW 3, HW 4, HW 5 HW 6, HW 7, HW 8, HW 9, Exam 1, Exam 2, Final Exam

Outcome (Student will be able to...)	Method of Assessment
– Identify common mistakes and/or limitations in a.) empirical and/or deductive reasoning, and b.) mathematical, quantitative, and/or logical problem solving.	HW 1, HW 2, HW 3, HW 4, HW 5 HW 6, HW 7, HW 8, HW 9, Exam 1, Exam 2, Final Exam
– Interpret mathematical models, formulas, graphs, and/or tables, to draw inferences from them, and explain these inferences.	HW 1, HW 2, HW 3, HW 4, HW 5 HW 6, HW 7, HW 8, HW 9, Exam 1, Exam 2, Final Exam

Course Schedule

Week	Sections	Topics	Exams
1	2.1, 2.2, 2.3	The tangent and velocity problems. Limit of a function. Calculating limits using limit laws.	
2	2.4, 2.5	The precise definition of a limit. Continuity.	
3	2.6, 2.7	Limits at infinity; horizontal asymptotes. Derivatives and rates of change.	
4	2.8, 1.4, 1.5	The derivative as a function. Inverse functions and logarithms. Inverse trigonometric functions. Exponential functions.	
5	3.1, 3.2, 3.3	Derivatives of polynomials and exponential functions. The product and quotient rules. Derivatives of trigonometric functions.	
6	3.4, 3.5, 3.6	The chain rule. Implicit differentiation. Derivatives of logarithmic and inverse trigonometric functions.	
7	3.8, 3.10	Exponential growth and decay. Linear approximation and differentials.	Exam 1
8	4.1, 4.2	Maximum and minimum values. The mean value theorem.	
9	4.3, 4.4	Derivatives and the shape of a graph. Indeterminate forms and L'Hospital's rule.	

Week	Sections	Topics	Exams
10	4.5, 4.7	Summary of curve sketching. Optimization problems.	
11	4.7, 4.9	Optimization problems. Antiderivatives.	
12	5.1, 5.2	Areas and distances. The definite integral.	Exam 2
13	5.3, 5.4	The fundamental theorem of calculus. Indefinite integrals and the Net Change Theorem.	
14	5.5	The substitution rule.	
15	N/A	Cumulative final exam during final exams week	Final Exam

Exam Schedule

Date	Subject
Week 7	Exam 1
Week 12	Exam 2
Week 15	Final Exam