Calculus with applications

Course number	MATH-AD 111
Credit hours	4
Class times	Mo We 16:00-17:15
Location	DTC, Room N-109
Pre-requisites	Successful completion of NYU Abu Dhabi placement test
Instructor	Erwan Biland, `eb135@nyu.edu`
	Office hours: Sama 1310, Tu Th 10:00-12:00
GAF	John Carges, `jfc338@nyu.edu` & Kenan Jijakli, `kj27@nyu.edu`
	Office hours: DTC SARC, Su 14:30-15-30, Tu 10:00-12:00

Course description

Contents

This course presents the foundations of calculus by examining functions and their derivatives and integrals. The derivative measures the instantaneous rate of change of a function; the definite integral measures the total accumulation of a function over an interval. These two ideas form the basis for nearly every mathematical formula in science. We also study the fundamental concepts of sequences and series.

This course provides instruction and understanding in how to model situations in order to solve problems in other disciplines. Applications include graphing, maximizing, and minimizing functions.

The course will prepare the student for more advanced mathematics courses, including multivariable calculus.

Course text

Single Variable Essential Calculus: Early Transcendentals, 2nd International Revised Edition, by James Stewart. ISBN-13: 9781133528630.

Intended schedule

We 08/28	The Limit of a Function (Section 1.3 of the book)
Mo 09/02	Calculating Limits (1.4)
We 09/04	Continuity (1.5)
Mo 09/09	Limits Involving Infinity (1.6)
We 09/11	Derivatives and Rates of Change, the Derivative as a Function (2.1, 2.2)
Su 09/15	**Quizz 1 (up to 1.6)**
Mo 09/16	First Look on Transcendental Functions (ln, exp, Hyperbolic Functions), Basic Differentiation Formulas (2.3)
We 09/18	The Product and Quotient Rules, the Chain Rule, Implicit Differentiation (2.4, 2.5, 2.6)
Mo 09/23	Indeterminate Forms and L'Hospital's Rule, Extremal Values (3.7, 4.1)
We 09/25	Derivatives and Shapes of Graphs, Curve Sketching (4.3, 4.4)
Sa 09/28	Optimization Problems, Inverse Functions (4.5, 3.1)
Su 09/29	**Quizz 2 (up to Wed 09/25)**
Mo 09/30	Second Look on Exponentials and Logarithms (3.1, 3.2, 3.3, 3.4)
We 10/02	Inverse Trigonometric and Hyperbolic Functions (3.5, 3.6)
Mo 10/07	Question Session, Problem Solving
We 10/09	**Midterm Exam (up to 4.5, except 4.2)**

Mo 10/21	The Mean Value Theorem, Antiderivatives (4.2, 4.7)
We 10/23	Areas and Distances, The Definite Integral (5.1, 5.2)
Mo 10/28	Evaluating Definite Integrals, The Fundamental Theorem of Calculus (5.3, 5.4)
We 10/30	The Substitution Rule (5.5)
Th 11/07	Integration by Parts (6.1)
Su 11/10	**Quizz 3 (Up to 5.5)**
Mo 11/11	Improper Integrals (6.6)
We 11/13	Sequences (8.1)
Mo 11/18	Series (8.2)
We 11/20	The Integral and Comparison Tests (8.3)
Su 11/24	**Quizz 4 (Up to 8.2)**
Mo 11/25	Other Convergence Tests (8.4)
We 11/27	Power Series (8.5)
We 12/04	Representing Functions as Power Series (8.6)
Mo 12/09	Taylor and Maclaurin Series, Applications (8.7, 8.8)
We 12/11	Question Session, Problem Solving
?? 12/??	**Final exam**

Teaching and learning methods
Lectures delivered by the instructor and class discussions are the main teaching tools. Students are expected to attend the lectures and weekly discussion sessions, and to consolidate their understanding of the material by solving weekly homework problems and WebAssign quizzes.

Outcomes assessment

Expected outcomes

At the end of the course, successful students will be able to:
- define a single-variable function, its domain, codomain and range;
- deal with exponential and logarithmic functions, with trigonometric or hyperbolic functions and their inverse functions;
- understand the notion of a finite or infinite limit at a finite or infinite point;
- compute a limit and solve indeterminate forms with L'Hospital's rule;
- compute the derivative of a function, using the chain rule if necessary;
- use a differential to obtain a linear approximation of a function;
- sketch the graph of a simple function using its derivative and limits;
- find the extremal points and values of a function;
- compute an antiderivative of a function, compute a definite or improper integral, using the substitution rule or integration by parts if necessary;
- apply those to compute areas and distances;
- study the convergence of a sequence and compute its limit;
- study the convergence of a series using, among others, the integral and comparison tests;
- compute the radius of convergence of a power series;
- compute and use the Taylor series of a given function.

Assessment and grading policy

Weekly homework assignments and Webassign quizzes will be graded. In addition, the students will have four in-class quizzes, a midterm exam and a final exam.
Graphing calculators are not allowed during quizzes and exams.
Final grade will be computed as follows:

Homework	10 %	(mean of 10 best grades)
WebAssign	10 %	(mean of 10 best grades)
In-class quizzes	10 %	(mean of 3 best grades)
Midterm exam	30 %	
Final exam	40 %	

Letter grades will be determined according to the following table.

Percent score	>92	90-92	87-89	83-86	80-82	75-79
Letter grade	A	A-	B+	B	B-	C+
Percent score	70-74	65-69	60-64	50-59	<50	
Letter grade	C	C-	D+	D	F	