Mathematics 265 Calculus I

Calendar Description: H(3-1T-1)

Limits, derivatives, and integrals; the calculus of exponential, logarithmic, trigonometric and inverse trigonometric functions. Applications including curve sketching, optimization, exponential growth and decay, Taylor polynomials. Fundamental theorem of calculus. Improper integrals. Introduction to partial differentiation.

Prerequisite(s): A grade of 70 per cent or higher in Mathematics 30-1 or Pure Mathematics 30; and a grade of 50 per cent or higher in Mathematics 31. (Alternatives to Pure Mathematics 30 are presented in C.1 Mathematics Diagnostic Test in the Academic Regulations section of this Calendar).

Antirequisite(s): Credit for more than one of Mathematics 249, 251, 265, 275, 281, or Applied Mathematics 217 will not be allowed.

Notes: This course provides the basic techniques of differential calculus as motivated by various applications. Students performing sufficiently well in a placement test may be advised to transfer directly to Mathematics 267.

Syllabus

Topics

Topics	**Number of Hours**
Review of Limits, Continuity, Derivatives and Integrals	6
Derivative and Applications	22
Integration and applications, Improper integrals	8
TOTAL HOURS	**36**

See accompanying page for a detailed breakdown of instructional hours and course outcomes.

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Detailed breakdown of instructional hours

Math 265 University Calculus I

LIMITS AND CONTINUITY	Hours
Review of power, trigonometric, exponential and logarithmic functions	(1)
Review of limits. Squeeze Theorem	(1)
Infinite limits and vertical asymptotes	(1)
Continuity, Intermediate Value Theorem	(1)

THE DERIVATIVE AND APPLICATIONS	
Review of derivatives, the differentiation formulas and rules, implicit differentiation	(1)
Differentiability, tangent line and linearization	(1.5)
Mean Value Theorem, Taylor's Theorem, Error in linear approximation	(2.5)
Inverse functions and their derivatives	(2)
Inverse trigonometric functions and their derivatives	(2)
Limit of sequences, Newton's method	(1)
Indeterminate forms and l'Hôpital's rule	(2)
Limits at infinity, horizontal asymptote, end behavior	(2)
Intervals of increase and decrease, critical points, local extrema, First derivative test	(1)
Concavity, points of inflection, Second derivative test	(1)
Curve Sketching	(2)
Absolute extrema	(1)
Optimization Problems	(2)
Rate of change in natural and social sciences	(0.5)
Exponential growth, decay, continuously compounded interest, the limit of (1 + r/n)^n	(1.5)

INTEGRATION	
Review of antiderivatives, indefinite integrals and the substitution method	(1)
Area, Riemann sum and the definite integral	(1)
Properties of the definite integral	(1)
Fundamental theorem of Calculus	(1.5)
Substitution rule for definite integrals	(1.5)
Improper integrals	(3)

Total = (36)

Course Outcomes

Overview. This course is the first course in the university calculus stream. We shall study the fundamental concepts and build the basic skills of Calculus. Specifically, by the end of this course students should be able to

1. use the language and notion of differential calculus, and apply the key concepts to compute derivatives of functions of a real variable.

2. explore the relationship between key calculus concepts and their geometric representation, and seek to apply calculus techniques to a wide variety of practical problems.

3. recognize that not only the technology can be used to achieve some desired results; but also it has limitations.

Subject specific knowledge.

4. **Mathematical Literacy** This includes the fluent reading, manipulation, and graphic interpretation of algebraic expressions and functions.

5. **The concept of Limit** Students will gain an intuition of the concept of limit, and acquire a basic level of mathematical literacy on limits and their computations.

6. **The concept of Derivative** Students will be to associate the concept of differentiation with rates of change, and they will be able to compute and manipulate derivatives.

7. **Applications of Derivatives** Students will be able to analyze the shape of functions through their derivatives. Students will use derivatives to solve a variety of applied problems, including optimization problems.

8. **The Riemann Integral** Students will explore the process of estimating areas under a curve, develop the notion of integral, and compute basic integrals. Students will be able to demonstrate the fundamental relations between the processes of integration and differentiation.

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Prerequisite change: 2009:07:01 EC:jml
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