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MAT 127 (Calculus II) - Course Syllabus

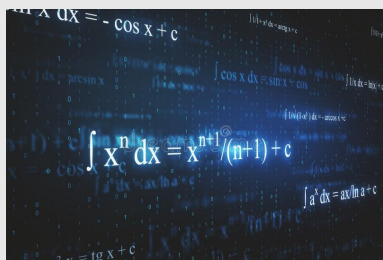
David Bradley

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Calculus II

MAT 127




 Prereq: C or better in MAT 126

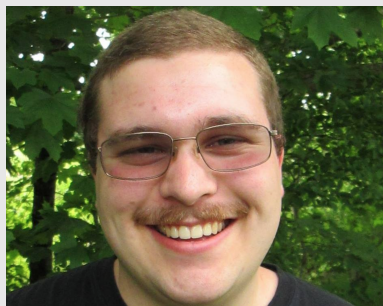
Professor _____

 **D. Bradley**
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 207-581-3955
 bradley@math.umaine.edu



Teaching Assistant




 **James Poulin**
 Office Hours:
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10am – noon Fridays
 james.r.poulin@maine.edu



Overview

Single variable calculus is the study of functions of a real variable from the viewpoint of the limiting processes of differentiation and integration. This course is a continuation of MAT 126 (Calculus I). The focus is on techniques and applications of integration, infinite sequences, infinite series, Taylor polynomials, and power series. A brief introduction to differential equations is also provided.

Reference Material

-  **Textbook:** Copies of *Single Variable Calculus* (3rd edition) by Briggs, Cochran, Gillet, and Schulz should be available at the campus bookstore.
-  **Course Notes:** Detailed lecture notes, with an extensive set of examples, problems, and complete solutions are available in Blackboard.
-  **Other Media:** Videos that briefly highlight important concepts and examples that could not be covered in on-campus lectures and recitations are also available in Blackboard.

Course Goals

- Reinforce concepts and skills acquired in algebra, trigonometry, pre-calculus, and prior calculus courses.
- Relate the definition of the integral as a limit of Riemann sums to its meaning as the net accumulation of a rate of change.
- Understand and exploit the relationship between the derivative and the integral as expressed in both parts of the fundamental theorem of calculus.
- Develop fluency with infinitesimals in setting up integrals to solve real-world problems.
- Model descriptions of physical situations with integrals, differential equations, and infinite series.
- Recognize whether a solution is reasonable based on considerations such as the sign, magnitude, and units of measurement.

Learning Objectives

- Use the fundamental theorem of calculus to deduce properties of indefinite integrals, such as monotonicity and convexity, and location of local extrema.
- Find anti-derivatives using substitution, integration by parts, and partial fractions.
- Set up and evaluate integrals for areas between curves, volumes and surface areas of revolution, arc lengths, and work done by variable forces.
- Determine whether improper integrals, infinite sequences, and infinite series converge or diverge.
- Recognize geometric series, and calculate their sums when convergent.
- Use the ratio test to determine the convergence radius of power series.
- Expand elementary functions in Taylor series, and estimate the remainder when truncated at finitely many terms.
- Employ Taylor series to calculate limits of indeterminate forms, evaluate integrals, and solve differential equations.
- Recognize differential equations satisfied by the standard elementary functions.
- Determine whether or not a given function satisfies a given differential equation.
- Solve special types of differential equations, such as simple, separable, first-order linear, and homogeneous with constant coefficients.
- Use differential equations to model real-world phenomena, such as population growth, radioactive decay, and Newton's law of cooling.

Assessment

Final grades will be calculated based on a weighted combination of assignments (40%), tests and quizzes (30%), and a cumulative final examination (30%).

Lectures



Mon., Wed. & Fri. through May 1



1:00 PM – 1:50 PM



<https://maine.zoom.us/j/616392084>

Recitations



Tues. & Thurs. through April 30



9:30 – 10:20 AM (Section 2016)



12:30 – 1:20 PM (Section 2017)



2:00 – 2:50 PM (Section 2018)



<https://maine.zoom.us/j/7953573026>

Math Lab



<https://umaine.edu/mathematics/math-lab/>

Tutor Program



207-581-2351



tutorprogram@maine.edu



<https://umaine.edu/tutorprogram/>

IT Help Center



207-581-2506



800-696-4357



help@maine.edu



<https://umaine.edu/it/>

Mandated Policy Declarations



[Web Link to Required Syllabus Information](#)

Class Schedule

MODULE 1: The Riemann Integral

Week 1	Riemann Sums	§5.1 Approximating Areas §5.2 Definite Integrals Fundamental Theorem of Calculus §5.3, Lecture Notes A01, A02
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MODULE 2: Integration Techniques

Week 2	Substitution Rule Change of Variable Integration by Parts	§5.3, Lecture Notes A03 §5.3, Lecture Notes A04 §8.2, Lecture Notes A05
Week 3	Trigonometric Integrals Trigonometric Substitution	§8.3, Lecture Notes A06 §8.4, Lecture Notes A07
Week 4	Partial Fractions Improper Integrals	§8.5, Lecture Notes A08 §8.9, Lecture Notes A09

MODULE 3: Applications of the Integral

Week 5	Velocity and Net Change Area Between Curves	§6.1 §6.2, Lecture Notes B0, B02
Week 6	Volumes of Revolution	§6.3, §6.4, Lecture Notes B03
Week 7	Arc Length Surface Area Review Module 1	§6.5, Lecture Notes B04 §6.6, Lecture Notes B05
Week 8	Review Modules 2 & 3 In-Class Test #1	

MODULE 4: Differential Equations

Week 9	Confirming a Solution Direction Fields and Euler's Method Exponential Growth and Decay	§9.1, Lecture Notes C01 §9.2 Lecture Notes C03
Week 10	Special Differential Equations Separable Differential Equations Modeling with Differential Equations	§9.4, Lecture Notes C03 §9.3, Lecture Notes C04 §9.5, Lecture Notes C04

MODULE 5: Sequences and Series

Week 11	Sequences Infinite Series Compound Interest	§10.1-2, Lecture Notes D01-D04 §10.3, Lecture Notes D05 Lecture Notes D23
Week 12	Divergence (n th Term) Test Ratio Test	§10.4, Lecture Notes D06 §10.7, Lecture Notes D14

MODULE 6: Power Series

Week 13	Taylor Polynomials Taylor Series Power Series	§11.1, Lecture Notes D17 §11.3, Lecture Notes D17, D18 §11.2, Lecture Notes D19
Week 14	Working with Taylor Series Review Modules 4,5, 6	§11.4, Lecture Notes D21, D22
Week 15	FINAL EXAM	Date, Time, Format TBA