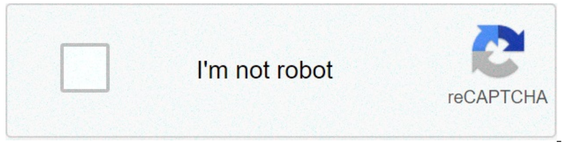

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Single variable differential calculus

Log in or Sign up to track your course progress, gain access to final exams, and get a free certificate of completion! This course and its exam closed on August 18, 2018. It is no longer possible to enroll in or obtain a certificate for this course. Skip Discuss Math Page ID33439 No headers IN THIS CHAPTER we study the differential calculus of functions of one variable. SECTION 2.1 introduces the concept of function and discusses arithmetic operations on functions, limits, one-sided limits, limits at \(\pm\infty\), and monotonic functions. SECTION 2.2 defines continuity and discusses removable discontinuities, composite functions, bounded functions, the intermediate value theorem, uniform continuity, and additional properties of monotonic functions. SECTION 2.3 introduces the derivative and its geometric interpretation. Topics covered include the interchange of differentiation and arithmetic operations, the chain rule, one-sided derivatives, extreme values of a differentiable function, Rolle's theorem, the intermediate value theorem for derivatives, and the mean value theorem and its consequences. SECTION 2.4 presents a comprehensive discussion of L'Hospital's rule. SECTION 2.5 discusses the approximation of a function \(f\) by the Taylor polynomials of \(f\) and applies this result to locating local extrema of \(f\). The section concludes with the extended mean value theorem, which implies Taylor's theorem. Was this article helpful? $195.00 Ranis Ibragimov and Pirooz Mohazzabi University of Wisconsin-Parkside, WI, USA Series: Mathematics Research Developments BISAC: MAT005000 This book presents a variety of calculus problems concerning different levels of difficulty with technically correct solutions and methodological steps that look also correct, but that have obviously wrong results (like 0 = 1). Those errors are aimed to be resolved by applying critical thinking (i.e., reasonable, reflective, responsible, and skillful thinking). This book is structured in such a way that finding a problem for a given solution with the wrong answer requires a proper diagnosis by asking the right questions, which is one of the first steps to critical thinking. The objective of this book is to motivate students to identify various strategies and to develop criteria for choosing a suitable strategy to resolve obvious errors or illogical statements. Details Additional information Help Table of Contents Preface Chapter 1. Introduction Chapter 2. Limits, Continuity and Derivatives Chapter 3. Derivative and Differentiation Chapter 4. Applications of Derivative Chapter 5. Integration Index Keywords: Critical thinking; Mathematical Modeling This book is meant for Calculus students and instructors. Exclude words from your search Put - in front of a word you want to leave out. For example, jaguar speed -car Search for an exact match Put a word or phrase inside quotes. For example, "tallest building". Search for wildcards or unknown words Put a * in your word or phrase where you want to leave a placeholder. For example, "largest * in the world". Search within a range of numbers Put .. between two numbers. For example, camera $50..$100. Combine searches Put "OR" between each search query. For example, marathon OR race. Page 2 Exclude words from your search Put - in front of a word you want to leave out. For example, jaguar speed -car Search for an exact match Put a word or phrase inside quotes. For example, "tallest building". Search for wildcards or unknown words Put a * in your word or phrase where you want to leave a placeholder. For example, "largest * in the world". Search within a range of numbers Put .. between two numbers. For example, camera $50..$100. Combine searches Put "OR" between each search query. For example, marathon OR race. This comprehensive course explores the fundamental topics of differential and integral calculus of a single variable, including limits, continuity, rates of change, differentiation, integration, introductory differential equations, infinite sequences and series, convergence and divergence of series, power series, and Taylor series and polynomials and their applications. Throughout the course, students will approach calculus using analytic, graphical, algorithmic, and numerical points of view, with an emphasis on rigorous problem-solving and high-level development of the mathematical content. Additionally, students will consider the historical development of calculus, and will form connections between the classical theory and modern applications of calculus. This course serves as a challenging and engaging course in single-variable calculus, and prepares students for more advanced work in mathematics. OM045 firmly situates calculus in the broader narrative of mathematical exploration, and fosters connections between students' previous coursework in mathematics, the discovery of calculus and the analysis of functions, and higher-level mathematics. This course is an alternative to AP Calculus AB and/or AP Calculus BC, and is not recommended for students who have already taken AP Calculus AB or BC. Jump into a comprehensive review of various functions from linear to exponential to trigonometric. Refresh how to evaluate different types of specific functions and operations including logarithms and inverse functions. Revisit graphing and calculating zeroes of different polynomial functions. Push yourself to the limit as you demonstrate knowledge of limits and derivatives. Learn to identify asymptotes, an important skill in function analysis. Analyze functions and determine the limits through calculation.Climb the slopes of calculus and dig deep for differentiation. Calculate a function's derivative both at specific points and as another function entirely. Apply rules such as the Quotient, Product, and Chain Rules to calculate derivatives of more complicated functions. Extend your knowledge of derivatives to trigonometric, hyperbolic, transcendental, and inverse functions. Also apply the concept of local linearity to create linear approximations.Use differentiation to determine max and min values, continuity through an interval, concavity of the curvature of a function, landmarks on a graph, and related rates. Continue to apply these techniques into a wide array of applications including finance, physics, chemistry, and when to throw a snowball before it melts too much.One of the most breakthrough moments in calculus was when it was discovered that integration and derivatives were reverse operations. While derivatives calculate small rates of change, integrals sum all these small changes back up. Begin by applying definite integrals to find area under a curve and indefinite integrals to find antiderivative functions. Learn about Riemann sums to approximate integrals and u-substitution as a method of solving more complex integrals.As a powerful tool in mathematics, integration can be used in any situation involving change to sum the small changes to find a total, even if those changes are not constant. Apply integration to problems involving total change over time, finding the area of unusual shapes, and even calculating the volume of complex figures. Also explore how integration can be used in other disciplines such as physics to determine values such as center of mass or work performed.Continue on the path to learn new methods of integration including integration by parts, trigonometric integration, partial fractions, and a revisit of L'Hopital's Rule. Apply these methods to solve more complex integrals, such as finding the area under an unbounded curve in an infinite integral.Revisit the concept of the limit and further explore sequences and series. Learn about convergence and divergence. Use different methods, including applying the integral, to test for convergence. Finally, discover power series such as the Taylor and Maclaurin series and their amazing ability to approximate complex functions around a point. Calculus is one of the grandest achievements of human thought, explaining everything from planetary orbits to the optimal size of a city to the periodicity of a heartbeat. This brisk course covers the core ideas of single-variable Calculus with emphases on conceptual understanding and applications. The course is ideal for students beginning in the engineering, physical, and social sciences. Distinguishing features of the course include: 1) the introduction and use of Taylor series and approximations from the beginning; 2) a novel synthesis of discrete and continuous forms of Calculus; 3) an emphasis on the conceptual over the computational; and 4) a clear, dynamic, unified approach.In this second part--part two of five--we cover derivatives, differentiation rules, linearization, higher derivatives, optimization, differentials, and differentiation operators. The book "Single variable Differential and Integral Calculus" is an interesting text book for students of mathematics and physics programs, and a reference book for graduate students in any engineering field. This book is unique in the field of mathematical analysis in content and in style. It aims to define, compare and discuss topics in single variable differential and integral calculus, as well as giving application examples in important business fields. Some elementary concepts such as the power of a set, cardinality, measure theory, measurable functions are introduced. It also covers real and complex numbers, vector spaces, topological properties of sets, series and sequences of functions (including complex-valued functions and functions of a complex variable), polynomials and interpolation and extrema of functions. Although analysis is based on the single variable models and applications, theorems and examples are all set to be converted to multi variable extensions. For example, Newton, Riemann, Stieltjes and Lebesque integrals are studied together and compared. Instruction Lectures and problem solving sessions. Assignments. Assessment Written examination at the end of the course (8 credits). Written and oral assignments (2 credits). Other directives The course may not be included in the same higher education qualifications as Derivatives and Integrals, Series and Ordinary Differential Equations, and Calculus for Engineers. 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