

Basic Integration Formulas and the Substitution Rule

1 The second fundamental theorem of integral calculus

Recall from the last lecture the second fundamental theorem of integral calculus.

Theorem Let $f(x)$ be a continuous function on the interval $[a,b]$. Let $F(x)$ be any function with the property that

$$F'(x) = f(x)$$

Then

$$\int_a^b f(x) dx = F(b) - F(a)$$

2 Antiderivatives

Let us now see how the second fundamental theorem gets applied to solve area problems.

Example Compute

$$\int_{10}^{20} \frac{1}{x^2} dx$$

According to the theorem, we need to find a function $F(x)$ with the property

$$F'(x) = 1/x^2$$

Such a function is called an anti-derivative of $1/x^2 = x^{-2}$. We can see that one possible solution is

$$F(x) = -x^{-1}$$

From the theorem

$$\int_{10}^{20} \frac{1}{x^2} dx = F(20) - F(10) = (-(20)^{-1}) - (-(10)^{-1}) = \frac{1}{20}$$

Unfortunately, this anti-differentiation process is not always easy to do.

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Basic Integration Formulas And The Substitution Rule:

EBOOK: Calculus: Early Transcendental Functions Robert T Smith, Roland Minton, 2011-02-16 Students who have used Smith Minton's Calculus say it was easier to read than any other math book they've used That testimony underscores the success of the authors approach which combines the best elements of reform with the most reliable aspects of mainstream calculus teaching resulting in a motivating challenging book Smith Minton also provide exceptional reality based applications that appeal to students interests and demonstrate the elegance of math in the world around us New features include A new organization placing all transcendental functions early in the book and consolidating the introduction to L'Hôpital's Rule in a single section More concisely written explanations in every chapter Many new exercises for a total of 7 000 throughout the book that require additional rigor not found in the 2nd Edition New exploratory exercises in every section that challenge students to synthesize key concepts to solve intriguing projects New commentaries Beyond Formulas that encourage students to think mathematically beyond the procedures they learn New counterpoints to the historical notes Today in Mathematics that stress the contemporary dynamism of mathematical research and applications connecting past contributions to the present An enhanced discussion of differential equations and additional applications of vector calculus

Integration For Calculus, Analysis, And Differential Equations: Techniques, Examples, And Exercises Marat V

Markin, 2018-07-13 The book assists Calculus students to gain a better understanding and command of integration and its applications It reaches to students in more advanced courses such as Multivariable Calculus Differential Equations and Analysis where the ability to effectively integrate is essential for their success Keeping the reader constantly focused on the three principal epistemological questions What for Why and How the book is designated as a supplementary instructional tool and consists of The Answers to all the 192 Problems are provided in the Answer Key The book will benefit undergraduates advanced undergraduates and members of the public with an interest in science and technology helping them to master techniques of integration at the level expected in a calculus course

Calculus Textbook for College and University USA Ibrahim Sikder, 2023-06-04 Calculus Textbook

Mathematics for Physicists Alexander Altland, Jan von Delft, 2019-02-14 This textbook is a comprehensive introduction to the key disciplines of mathematics linear algebra calculus and geometry needed in the undergraduate physics curriculum Its leitmotiv is that success in learning these subjects depends on a good balance between theory and practice Reflecting this belief mathematical foundations are explained in pedagogical depth and computational methods are introduced from a physicist's perspective and in a timely manner This original approach presents concepts and methods as inseparable entities facilitating in depth understanding and making even advanced mathematics tangible The book guides the reader from high school level to advanced subjects such as tensor algebra complex functions and differential geometry It contains numerous worked examples info sections providing context biographical boxes several detailed case studies over 300 problems and fully worked solutions for all odd numbered problems

An online solutions manual for all even numbered problems will be made available to instructors

CK-12 Calculus CK-12 Foundation,2010-08-15 CK 12 Foundation s Single Variable Calculus FlexBook introduces high school students to the topics covered in the Calculus AB course Topics include Limits Derivatives and Integration

Ebook: Fundamental Methods of Mathematical Economics Chiang,2005-06-16 Ebook Fundamental Methods of Mathematical Economics

Instructor's Resource Guide for Calculus, an Applied Approach, Fifth Edition, Larson/Edwards Bruce H. Edwards,1999

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Brief Calculus with Applications Alternate Roland E. Larson,Robert P. Hostetler,1990-04

Calculus Ron Larson,Bruce H. Edwards,1999

Calculus and Its Applications Daniel D. Benice,1992-11 Written for use in two term introductory business calculus courses this text has a strong emphasis on applications and a reduced emphasis on the theory and rigorous formal proofs typical of higher level maths courses This is balanced with a development of the concepts of calculus

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An Introduction to the Study of the Elements of the Differential and Integral Calculus Axel Harnack,1891

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