linear approximation in calculus

linear approximation in calculus is a fundamental concept that simplifies the process of estimating the value of a function near a given point. It is particularly useful when dealing with complex functions that are difficult to evaluate directly. The principle behind linear approximation relies on the idea of using the tangent line at a specific point to estimate nearby values of the function. This article will explore the definition of linear approximation, its mathematical foundation, applications, and examples to illustrate its practical use. We will also discuss the limitations of linear approximation and how it relates to other calculus concepts.

Understanding Linear Approximation

Linear approximation is a method in calculus that enables one to estimate the value of a function at a point close to a known point. This technique is particularly beneficial when direct calculation is cumbersome or impossible. The core idea is to utilize the tangent line of the function at a certain point, which provides a linear function that closely resembles the original function near that point.

The linear approximation can be expressed mathematically as follows: if $f(x)$ is a function that is differentiable at a point a, then the linear approximation $L(x)$ of $f(x)$ near a is given by:

$$L(x) = f(a) + f'(a)(x - a)$$

In this equation, $f(a)$ is the value of the function at a, and $f'(a)$ is the derivative of the function at that point, which represents the slope of the tangent line. By using this linear function, one can predict values of $f(x)$ for x values close to a.

Mathematical Foundation

The mathematical foundation of linear approximation is rooted in the concept of the derivative. The derivative at a point gives the instantaneous rate of change of the function at that point, which is the slope of the tangent line. The tangent line provides a best linear fit for the function at that point, allowing for approximations of the function's value.

The Derivative and Tangent Lines

To grasp linear approximation, it is crucial to understand derivatives and tangent lines. The derivative $f'(x)$ of a function $f(x)$ at a point a can be defined as:

$$f'(a) = \lim_{h \to 0} \frac{f(a + h) - f(a)}{h}$$

This limit describes how the function changes as h, a small increment, approaches zero. The tangent line at the point $(a, f(a))$ can then be expressed as:

$$y = f'(a)(x - a) + f(a)$$

Thus, the equation for linear approximation can be derived directly from the definition of the derivative.

Higher-Order Approximations

While linear approximation uses the first derivative, higher-order approximations involve second or higher derivatives. These provide more accurate estimates over a larger interval. The Taylor series is an example where functions are approximated using derivatives of all orders, enabling better accuracy for functions that deviate significantly from linear behavior.

Applications of Linear Approximation

Linear approximation has numerous applications across various fields, from engineering to physics to economics. It is particularly useful in situations where precise calculations are not feasible, or where quick estimations are required.

Real-World Applications

- **Physics**: In physics, linear approximation can be used to estimate small changes in physical quantities, such as displacement or velocity, when dealing with complex systems.
- **Economics**: Economists often use linear approximations to model changes in supply and demand, allowing for quick assessments of market behavior with small changes in price or quantity.

- **Engineering:** Engineers utilize linear approximation when designing systems that require rapid calculations, such as load estimations in structural analysis.

Scientific Research

In scientific research, linear approximation aids in data analysis and interpretation, especially when working with models that describe complex phenomena. By simplifying equations, researchers can derive manageable results that provide insights into their studies.

Examples of Linear Approximation

To better understand linear approximation, consider the following examples that illustrate its application.

Example 1: Approximating a Function Value

Let us take the function $f(x) = x^2$ and approximate its value near $a = 2$. First, we find the derivative:

$$f'(x) = 2x \Rightarrow f'(2) = 2(2) = 4$$

Now, using the linear approximation formula:

$$L(x) = f(2) + f'(2)(x - 2) = 4 + 4(x - 2)$$

For $x = 2.1$:

$$L(2.1) = 4 + 4(2.1 - 2) = 4 + 0.4 = 4.4$$

The actual value of $f(2.1) = (2.1)^2 = 4.41$. Thus, the linear approximation is quite close.

Example 2: Approximating a Trigonometric Function

Consider the function $f(x) = \sin(x)$ and we wish to approximate it at $a = 0$. The derivative at this point is:

$$f'(x) = \cos(x) \Rightarrow f'(0) = 1$$

Using the same approximation formula:

$$L(x) = \sin(0) + \cos(0)(x - 0) = 0 + 1(x) = x$$

For small values of x (e.g., $x = 0.1$), $L(0.1) = 0.1$ and the actual value $\sin(0.1) \approx 0.0998$, demonstrating the effectiveness of the approximation.

Limitations of Linear Approximation

While linear approximation is a powerful tool, it does have limitations that users must recognize. The primary limitation is that it is only accurate near the point of tangency.

Accuracy and Range

As x moves further away from the point a, the linear approximation may become less accurate. This is particularly true for non-linear functions where higher-order terms significantly impact the function's behavior.

Non-differentiable Points

Additionally, linear approximation cannot be applied at non-differentiable points, as there is no tangent line to provide a linear estimate. Thus, it is essential to ensure that the function is smooth and continuous within the desired range of approximation.

Relation to Other Calculus Concepts

Linear approximation is closely related to various other concepts in calculus, including the Taylor series and differential calculus. Understanding these relationships enhances comprehension and application of linear approximation in broader contexts.

Taylor Series

The Taylor series extends the idea of linear approximation by including higher-order derivatives. This series provides a more precise representation of functions over larger intervals, thus overcoming some limitations of linear approximation.

Differentials

In differential calculus, the concept of differentials is another way to express linear approximation. The differential dy can be defined as:

$$dy = f'(x)dx$$

This relates to how small changes in x lead to changes in y, reinforcing the fundamental idea behind linear approximation.

Linear approximation in calculus is an essential technique that simplifies estimations of function values near a known point. With a solid foundation in derivatives, applications across various fields, and illustrative examples, it serves as a valuable tool for students, researchers, and professionals alike. Understanding its limitations and connections to other calculus concepts further enhances its utility in mathematical analysis.

Q: What is linear approximation in calculus?

A: Linear approximation is a method used to estimate the value of a function near a specific point using the tangent line at that point. It is based on the derivative of the function and provides a linear function that closely resembles the original function in the neighborhood of that point.

Q: How is linear approximation calculated?

A: To calculate linear approximation, use the formula $L(x) = f(a) + f'(a)(x - a)$, where $f(a)$ is the function value at point a and $f'(a)$ is the derivative at that point. This formula generates a tangent line that can estimate function values close to a.

Q: In what fields is linear approximation used?

A: Linear approximation is widely used in fields such as physics, economics, engineering, and scientific research. It is particularly valuable for making quick estimates where precise calculations are not feasible.

Q: What are the limitations of linear approximation?

A: The primary limitations of linear approximation include its accuracy being confined to points near the tangency and the inability to be applied at non-differentiable points. As one moves further from the point of approximation, accuracy can significantly decrease.

Q: How does linear approximation differ from Taylor series?

A: Linear approximation uses only the first derivative to estimate function values, while Taylor series includes higher-order derivatives to provide a more accurate approximation over a larger interval. Taylor series expands the function into an infinite series for better accuracy.

Q: Can linear approximation be used for non-linear functions?

A: Yes, linear approximation can be applied to non-linear functions, but its effectiveness diminishes as one moves away from the point of approximation. It is most accurate for small intervals around the point of tangency.

Q: What is the significance of the derivative in linear approximation?

A: The derivative is crucial in linear approximation as it provides the slope of the tangent line at the point of interest. This slope determines how the linear function will approximate the original function near that point.

Q: How do you apply linear approximation in real-world scenarios?

A: In real-world scenarios, linear approximation can be applied to estimate values quickly in various contexts, such as predicting physical quantities in engineering, calculating economic outcomes, or simplifying complex scientific models.

Q: Is linear approximation applicable in all mathematical functions?

A: Linear approximation is not applicable to all functions. It requires the function to be differentiable at the point of approximation. Functions that are discontinuous or have sharp corners cannot utilize linear approximation effectively.

Linear Approximation In Calculus

linear approximation in calculus: Linear Approximation Arthur Sard, 1963 Many approximations are linear, that is, conform to the principle of super-position, and may profitably be studied by means of the theory of linear spaces. This book sets forth the pertinent parts of that theory, with particular attention to the key spaces C_n, B, K, and Hilbert space.

linear approximation in calculus: Calculus Textbook for College and University USA Ibrahim Sikder, 2023-06-04 Calculus Textbook

linear approximation in calculus: The Best Linear Approximation of Polynomial Functions Owilender K. Grant, 1978

linear approximation in calculus: Numerical Optimization Udayan Bhattacharya, 2025-02-20 Numerical Optimization: Theories and Applications is a comprehensive guide that delves into the fundamental principles, advanced techniques, and practical applications of numerical optimization. We provide a systematic introduction to optimization theory, algorithmic methods, and real-world applications, making it an essential resource for students, researchers, and practitioners in optimization and related disciplines. We begin with an in-depth exploration of foundational concepts in optimization, covering topics such as convex and non-convex optimization, gradient-based methods, and optimization algorithms. Building upon these basics, we delve into advanced optimization techniques, including metaheuristic algorithms, evolutionary strategies, and stochastic optimization methods, providing readers with a comprehensive understanding of state-of-the-art optimization methods. Practical applications of optimization are highlighted throughout the book, with case studies and examples drawn from various domains such as machine learning, engineering design, financial portfolio optimization, and more. These applications demonstrate how optimization techniques can effectively solve complex real-world problems. Recognizing the importance of ethical considerations, we address issues such as fairness, transparency, privacy, and societal impact, guiding readers on responsibly navigating these considerations in their optimization projects. We discuss computational challenges in optimization, such as high dimensionality, non-convexity, and scalability issues, and provide strategies for overcoming these challenges through algorithmic innovations, parallel computing, and optimization software. Additionally, we provide a comprehensive overview of optimization software and libraries, including MATLAB Optimization Toolbox, Python libraries like SciPy and CVXPY, and emerging optimization frameworks, equipping readers with the tools and resources needed to implement optimization algorithms in practice. Lastly, we explore emerging trends, future directions, and challenges in optimization, offering insights into the evolving landscape of optimization research and opportunities for future exploration.

linear approximation in calculus: Asset Pricing and Portfolio Choice Theory Kerry Back, 2010-08-12 In Asset Pricing and Portfolio Choice Theory, Kerry E. Back at last offers what is at once a welcoming introduction to and a comprehensive overview of asset pricing. Useful as a textbook for graduate students in finance, with extensive exercises and a solutions manual available for professors, the book will also serve as an essential reference for scholars and professionals, as it includes detailed proofs and calculations as section appendices. Topics covered include the classical results on single-period, discrete-time, and continuous-time models, as well as various proposed explanations for the equity premium and risk-free rate puzzles and chapters on heterogeneous beliefs, asymmetric information, non-expected utility preferences, and production models. The book includes numerous exercises designed to provide practice with the concepts and to introduce additional results. Each chapter concludes with a notes and references section that supplies pathways to additional developments in the field.

linear approximation in calculus: Introduction To Real Analysis Liviu I Nicolaescu, 2019-10-30 This is a text that develops calculus 'from scratch', with complete rigorous arguments. Its aim is to introduce the reader not only to the basic facts about calculus but, as importantly, to mathematical reasoning. It covers in great detail calculus of one variable and multivariable calculus. Additionally it offers a basic introduction to the topology of Euclidean space. It is intended to more advanced or highly motivated undergraduates.

linear approximation in calculus: Foundations of Modern Analysis J. Dieudonne, 2011-03-23 In this text, the whole structure of analysis is built up from the foundations. The only things assumed at the outset are the rules of logic and the usual properties of the natural numbers, and with these two exceptions all the proofs in the text rest on the axioms and theorems proved earlier. Nevertheless this treatise (including the first volume) is not suitable for students who have not yet covered the first two years of an undergraduate honours course in mathematics. A striking characteristic of the elementary parts of analysis is the small amount of algebra required. Effectively all that is needed is some elementary linear algebra (which is included in an appendix at the end of the first volume, for the reader’s convenience). However, the role played by algebra increases in the subsequent volumes, and we shall finally leave the reader at the point where this role becomes preponderant, notably with the appearance of advanced commutative algebra and homological algebra. As reference books in algebra we have taken R. Godement’s “Abstract Algebra,” and S. A. Lang’s “Algebra” which we shall possibly augment in certain directions by means of appendices. As with the first volume, I have benefited greatly during the preparation of this work from access to numerous unpublished manuscripts of N. Bourbaki and his collaborators. To them alone is due any originality in the presentation of certain topics.

linear approximation in calculus: How Mathematicians Think William Byers, 2010-04-12 To many outsiders, mathematicians appear to think like computers, grimly grinding away with a strict formal logic and moving methodically--even algorithmically--from one black-and-white deduction to another. Yet mathematicians often describe their most important breakthroughs as creative, intuitive responses to ambiguity, contradiction, and paradox. A unique examination of this less-familiar aspect of mathematics, How Mathematicians Think reveals that mathematics is a profoundly creative activity and not just a body of formalized rules and results. Nonlogical qualities, William Byers shows, play an essential role in mathematics. Ambiguities, contradictions, and paradoxes can arise when ideas developed in different contexts come into contact. Uncertainties and conflicts do not impede but rather spur the development of mathematics. Creativity often means bringing apparently incompatible perspectives together as complementary aspects of a new, more subtle theory. The secret of mathematics is not to be found only in its logical structure. The creative dimensions of mathematical work have great implications for our notions of mathematical and scientific truth, and How Mathematicians Think provides a novel approach to many fundamental questions. Is mathematics objectively true? Is it discovered or invented? And is there such a thing as a final scientific theory? Ultimately, How Mathematicians Think shows that the nature of mathematical thinking can teach us a great deal about the human condition itself.

linear approximation in calculus: First Steps in Differential Geometry Andrew McInerney, 2013-07-09 Differential geometry arguably offers the smoothest transition from the standard university mathematics sequence of the first four semesters in calculus, linear algebra, and differential equations to the higher levels of abstraction and proof encountered at the upper division by mathematics majors. Today it is possible to describe differential geometry as the study of structures on the tangent space, and this text develops this point of view. This book, unlike other introductory texts in differential geometry, develops the architecture necessary to introduce symplectic and contact geometry alongside its Riemannian cousin. The main goal of this book is to bring the undergraduate student who already has a solid foundation in the standard mathematics curriculum into contact with the beauty of higher mathematics. In particular, the presentation here emphasizes the consequences of a definition and the careful use of examples and constructions in order to explore those consequences.

linear approximation in calculus: Undergraduate Mathematics for the Life Sciences Glenn Ledder, Jenna P. Carpenter, Timothy D. Comar, 2013 There is a gap between the extensive mathematics background that is beneficial to biologists and the minimal mathematics background biology students acquire in their courses. The result is an undergraduate education in biology with very little quantitative content. New mathematics courses must be devised with the needs of biology students in mind. In this volume, authors from a variety of institutions address some of the problems involved in reforming mathematics curricula for biology students. The problems are sorted into three themes: Models, Processes, and Directions. It is difficult for mathematicians to generate curriculum ideas for the training of biologists so a number of the curriculum models that have been introduced at various institutions comprise the Models section. Processes deals with taking that great course and making sure it is institutionalized in both the biology department (as a requirement) and in the mathematics department (as a course that will live on even if the creator of the course is no longer on the faculty). Directions looks to the future, with each paper laying out a case for pedagogical developments that the authors would like to see.

linear approximation in calculus: *A Primer of Analytic Number Theory* Jeffrey Stopple, 2003-06-23 This 2003 undergraduate introduction to analytic number theory develops analytic skills in the course of studying ancient questions on polygonal numbers, perfect numbers and amicable pairs. The question of how the primes are distributed amongst all the integers is central in analytic number theory. This distribution is determined by the Riemann zeta function, and Riemann's work shows how it is connected to the zeroes of his function, and the significance of the Riemann Hypothesis. Starting from a traditional calculus course and assuming no complex analysis, the author develops the basic ideas of elementary number theory. The text is supplemented by series of exercises to further develop the concepts, and includes brief sketches of more advanced ideas, to present contemporary research problems at a level suitable for undergraduates. In addition to proofs, both rigorous and heuristic, the book includes extensive graphics and tables to make analytic concepts as concrete as possible.

linear approximation in calculus: Contributions to Statistical Convergence of Linear Approximation Processes in Q-calculus Cristina Ancuţa Radu, 2009

linear approximation in calculus: Asset Pricing and Portfolio Choice Theory Kerry E. Back, 2017-01-04 In the 2nd edition of Asset Pricing and Portfolio Choice Theory, Kerry E. Back offers a concise yet comprehensive introduction to and overview of asset pricing. Intended as a textbook for asset pricing theory courses at the Ph.D. or Masters in Quantitative Finance level with extensive exercises and a solutions manual available for professors, the book is also an essential reference for financial researchers and professionals, as it includes detailed proofs and calculations as section appendices. The first two parts of the book explain portfolio choice and asset pricing theory in single-period, discrete-time, and continuous-time models. For valuation, the focus throughout is on stochastic discount factors and their properties. A section on derivative securities covers the usual derivatives (options, forwards and futures, and term structure models) and also applications of perpetual options to corporate debt, real options, and optimal irreversible investment. A chapter on explaining puzzles and the last part of the book provide introductions to a number of additional current topics in asset pricing research, including rare disasters, long-run risks, external and internal habits, asymmetric and incomplete information, heterogeneous beliefs, and non-expected-utility preferences. Each chapter includes a Notes and References section providing additional pathways to the literature. Each chapter also includes extensive exercises.

linear approximation in calculus: Introduction to Smooth Manifolds John Lee, 2012-08-27 This book is an introductory graduate-level textbook on the theory of smooth manifolds. Its goal is to familiarize students with the tools they will need in order to use manifolds in mathematical or scientific research--- smooth structures, tangent vectors and covectors, vector bundles, immersed and embedded submanifolds, tensors, differential forms, de Rham cohomology, vector fields, flows, foliations, Lie derivatives, Lie groups, Lie algebras, and more. The approach is as concrete as possible, with pictures and intuitive discussions of how one should think geometrically about the abstract concepts, while making full use of the powerful tools that modern mathematics has to offer. This second edition has been extensively revised and clarified, and the topics have been substantially rearranged. The book now introduces the two most important analytic tools, the rank theorem and the fundamental theorem on flows, much earlier so that they can be used throughout the book. A fewnew topics have been added, notably Sard’s theorem and transversality, a proof that infinitesimal Lie group actions generate global group actions, a more thorough study of first-order partial differential equations, a brief treatment of degree theory for smooth maps between compact manifolds, and an introduction to contact structures. Prerequisites include a solid acquaintance with general topology, the fundamental group, and covering spaces, as well as basic undergraduate linear algebra and real analysis.

linear approximation in calculus: Treatise on Analysis Jean Dieudonne, 1960-08-28 Treatise on Analysis

linear approximation in calculus: Optimization Jan Brinkhuis, Vladimir Tikhomirov, 2011-02-11 This self-contained textbook is an informal introduction to optimization through the use of numerous illustrations and applications. The focus is on analytically solving optimization problems with a finite number of continuous variables. In addition, the authors provide introductions to classical and modern numerical methods of optimization and to dynamic optimization. The book's overarching point is that most problems may be solved by the direct application of the theorems of Fermat, Lagrange, and Weierstrass. The authors show how the intuition for each of the theoretical results can be supported by simple geometric figures. They include numerous applications through the use of varied classical and practical problems. Even experts may find some of these applications truly surprising. A basic mathematical knowledge is sufficient to understand the topics covered in this book. More advanced readers, even experts, will be surprised to see how all main results can be grounded on the Fermat-Lagrange theorem. The book can be used for courses on continuous optimization, from introductory to advanced, for any field for which optimization is relevant.

linear approximation in calculus: Approximately Calculus Shahriar Shahriari, 2006 Is there always a prime number between n and $2n$? Where, approximately, is the millionth prime? And just what does calculus have to do with answering either of these questions? It turns out that calculus has a lot to do with both questions, as this book can show you. The theme of the book is approximations. Calculus is a powerful tool because it allows us to approximate complicated functions with simpler ones. Indeed, replacing a function locally with a linear--or higher order--approximation is at the heart of calculus. The real star of the book, though, is the task of approximating the number of primes up to a number x. This leads to the famous Prime Number Theorem--and to the answers to the two questions about primes. While emphasizing the role of approximations in calculus, most major topics are addressed, such as derivatives, integrals, the Fundamental Theorem of Calculus, sequences, series, and so on. However, our particular point of view also leads us to many unusual topics: curvature, Pade approximations, public key cryptography, and an analysis of the logistic equation, to name a few. The reader takes an active role in developing the material by solving problems. Most topics are broken down into a series of manageable problems, which guide you to an understanding of the important ideas. There is also ample exposition to fill in background material and to get you thinking appropriately about the concepts. Approximately Calculus is intended for the reader who has already had an introduction to calculus, but wants to engage the concepts and ideas at a deeper level. It is suitable as a text for an honors or alternative second semester calculus course.

linear approximation in calculus: Climate Mathematics Samuel S. P. Shen, Richard C. J. Somerville, 2019-09-19 Presents the core mathematics, statistics, and programming skills needed for modern climate science courses, with online teaching materials.

linear approximation in calculus: Six Sources of Collapse Charles R. Hadlock, 2012 An accessible investigation into the mathematics behind collapse processes, ranging from crashing financial markets to extreme weather to ecological disasters.

linear approximation in calculus: Spacetime, Geometry, Cosmology William L. Burke, 2020-12-16 Novel interpretation of the relationship between space, time, gravitation, and their cosmological implications; based on author's discovery of a value in gravitation overlooked by both Newton and Einstein. 1982 edition.

Related to linear approximation in calculus

LINEAR Definition & Meaning - Merriam-Webster The meaning of LINEAR is of, relating to, resembling, or having a graph that is a line and especially a straight line : straight. How to use linear in a sentence

Nice/Linear | Professional Access Control Company From pioneering radio frequency remote controls to developing the latest commercial access control, keypad and telephone entry systems and offering a complete line of garage and gate

Linear – Plan and build products Linear is shaped by the practices and principles that distinguish world-class product teams from the rest: relentless focus, fast execution, and a commitment to the quality of craft

LINEAR Definition & Meaning | Linear definition: of, consisting of, or using lines.. See examples of LINEAR used in a sentence
Linear algebra - Wikipedia Linear algebra is the branch of mathematics concerning linear equations such as linear maps such as and their representations in vector spaces and through matrices. [1][2][3] In three
LINEAR | English meaning - Cambridge Dictionary LINEAR definition: 1. consisting of relating to lines or length: 2. involving events or thoughts in which one follows
Linear - definition of linear by The Free Dictionary 1. of, consisting of, or using lines: linear design. 2. pertaining to or represented by lines: linear dimensions. 3. extended or arranged in a line: a linear series. 4. involving measurement in one
linear - Wiktionary, the free dictionary linear (comparative more linear, superlative most linear) Having the form of a line; straight or roughly straight; following a direct course. quotations
LINEAR definition and meaning | Collins English Dictionary A linear process or development is one in which something changes or progresses straight from one stage to another, and has a starting point and an ending point
linear adjective - Definition, pictures, pronunciation and usage notes Definition of linear adjective in Oxford Advanced American Dictionary. Meaning, pronunciation, picture, example sentences, grammar, usage notes, synonyms and more
LINEAR Definition & Meaning - Merriam-Webster The meaning of LINEAR is of, relating to, resembling, or having a graph that is a line and especially a straight line : straight. How to use linear in a sentence
Nice/Linear | Professional Access Control Company From pioneering radio frequency remote controls to developing the latest commercial access control, keypad and telephone entry systems and offering a complete line of garage and gate
Linear – Plan and build products Linear is shaped by the practices and principles that distinguish world-class product teams from the rest: relentless focus, fast execution, and a commitment to the quality of craft
LINEAR Definition & Meaning | Linear definition: of, consisting of, or using lines.. See examples of LINEAR used in a sentence
Linear algebra - Wikipedia Linear algebra is the branch of mathematics concerning linear equations such as linear maps such as and their representations in vector spaces and through matrices. [1][2][3] In three
LINEAR | English meaning - Cambridge Dictionary LINEAR definition: 1. consisting of relating to lines or length: 2. involving events or thoughts in which one follows
Linear - definition of linear by The Free Dictionary 1. of, consisting of, or using lines: linear design. 2. pertaining to or represented by lines: linear dimensions. 3. extended or arranged in a line: a linear series. 4. involving measurement in one
linear - Wiktionary, the free dictionary linear (comparative more linear, superlative most linear) Having the form of a line; straight or roughly straight; following a direct course. quotations
LINEAR definition and meaning | Collins English Dictionary A linear process or development is one in which something changes or progresses straight from one stage to another, and has a starting point and an ending point
linear adjective - Definition, pictures, pronunciation and usage notes Definition of linear adjective in Oxford Advanced American Dictionary. Meaning, pronunciation, picture, example sentences, grammar, usage notes, synonyms and more

Related to linear approximation in calculus

Casting Out Nines: Piecewise-linear calculus part 2: Getting to smoothness (The Chronicle of Higher Education15y) This is the second post (here’s the first one) about an approach to introducing the derivative to calculus students that is counter to what I’ve seen in textbooks and other traditional treatments of

Casting Out Nines: Piecewise-linear calculus part 2: Getting to smoothness (The Chronicle of Higher Education15y) This is the second post (here’s the first one) about an approach to introducing the derivative to calculus students that is counter to what I’ve seen in textbooks and other traditional treatments of
LINEAR APPROXIMATIONS IN A CLASS OF NON-LINEAR VECTOR DIFFERENTIAL EQUATIONS (JSTOR Daily8y) The Quarterly of Applied Mathematics contains original papers in applied mathematics which have a close connection with applications. An author index appears in the last issue of each volume. This
LINEAR APPROXIMATIONS IN A CLASS OF NON-LINEAR VECTOR DIFFERENTIAL EQUATIONS (JSTOR Daily8y) The Quarterly of Applied Mathematics contains original papers in applied mathematics which have a close connection with applications. An author index appears in the last issue of each volume. This
The Freshman's Dream: A Crash Course In Linear Functions (Forbes8y) I've been grading calculus exams this week, and even though my students did quite well overall there were a couple of errors that I see every semester. Errors that make mathematicians' heads explode
The Freshman's Dream: A Crash Course In Linear Functions (Forbes8y) I've been grading calculus exams this week, and even though my students did quite well overall there were a couple of errors that I see every semester. Errors that make mathematicians' heads explode
Stein's Method and Random Variable Approximations (Nature4mon) Stein's method has emerged as a critical framework in the study of distributional approximations, providing quantitative bounds between probability distributions through the formulation and solution
Stein's Method and Random Variable Approximations (Nature4mon) Stein's method has emerged as a critical framework in the study of distributional approximations, providing quantitative bounds between probability distributions through the formulation and solution

Back to Home: https://ns2.kelisto.es