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Numerical Mathematics - Alfio Quarteroni 2017-01-26
The purpose of this book is to provide the mathematical foundations of numerical methods, to analyze their basic theoretical properties and to demonstrate their performances on examples and counterexamples. Within any specific class of problems, the most appropriate scientific computing algorithms are reviewed, their theoretical analyses are carried out and the expected results are verified using the MATLAB software environment. Each chapter contains examples, exercises and applications of the theory discussed to the solution of real-life problems. While addressed to senior undergraduates and graduates in engineering, mathematics, physics and computer sciences, this text is also valuable for researchers and users of scientific computing in a large variety of professional fields.

Procesamiento de magnitudes numéricas y ejecución matemática - Orrantia, Josetxu
Recientes investigaciones sugieren que las diferencias individuales en ejecución matemática están relacionadas con las habilidades de procesamiento numérico básico, tales como la capacidad para procesar magnitudes numéricas. Una cuestión clave en este reciente campo de investigación es qué habilidades relacionadas con el procesamiento de magnitudes predicen la ejecución en matemáticas, el procesamiento de magnitudes no simbólicas o el acceso a esas magnitudes desde los números simbólicos. En este estudio extendemos esta investigación analizando el rol del tamaño de las magnitudes utilizando un diseño predictivo longitudinal. Cincuenta y dos participantes de 1º de Educación Primaria fueron evaluados en tareas de procesamiento de magnitudes numéricas, tanto simbólicas como no simbólicas con cantidades grandes y pequeñas, y dos años después se les evaluó en ejecución matemática. Los análisis de regresión jerárquica muestran que el procesamiento de magnitudes simbólicas de cantidades grandes (dos dígitos) es un predictor más robusto de la futura ejecución matemática que las demás medidas de procesamiento de magnitudes. Estos resultados se interpretan en términos de sus implicaciones educativas, específicamente en aspectos relacionados con la identificación temprana de estudiantes en riesgo de presentar dificultades en el aprendizaje de las matemáticas, algo prioritario en cualquier sistema educativo desde el punto de vista de la prevención.

Real Algebraic Geometry - Vladimir I. Arnold 2013-04-15
This book is concerned with one of the most fundamental questions of mathematics: the relationship between algebraic formulas and geometric images. At one of the first international mathematical congresses (in Paris in 1900), Hilbert stated a special case of this question in the form of his 16th problem (from his list of 23 problems left over from the nineteenth century as a legacy for the twentieth century). In spite of the simplicity and importance of this problem (including its numerous applications), it remains unsolved to this day (although, as you will now see, many remarkable results have been discovered).

MATEMATICAS BASICAS. Una Introducción al Cálculo - Alix Fuentes 2016-08-31
"MATEMATICAS BASICAS. Una Introducción al Cálculo" tiene una fácil manera para aprender a aprender Matemáticas con cuatro capítulos principales; el primero está referido a la teoría de conjuntos, el sistema numérico y la recta real, junto con el sistema cartesiano del plano y espacio. El segundo capítulo muestra aplicaciones de la teoría de conjuntos, las permutaciones, las combinaciones, las relaciones y las funciones. El tercer capítulo ilustra traslaciones y modelos funcionales con los tipos de funciones: real, polinómica, constante, lineal, cuadrática, exponencial, logarítmica, trigonométricas y función inversa. El cuarto capítulo desarrolla las ecuaciones y desigualdades, junto con sistemas de ecuaciones y desigualdades lineales o no lineales. El quinto capítulo

concluye con ejercicios de recapitulación resueltos. Esta obra está dirigida a estudiantes universitarios en programas académicos presenciales o de educación a distancia en ciencias económicas, administrativas, sociales y humanísticas.
Gratings: Theory and Numeric Applications -

Matematica Numerica - Alfio Quarteroni 2014-03-13
La Matematica Numerica è elemento fondante del calcolo scientifico. Punto di contatto di diverse discipline nella matematica e nelle moderne scienze applicate, ne diventa strumento di indagine qualitativa e quantitativa. Scopo di questo testo è fornire i fondamenti metodologici della matematica numerica, richiamandone le principali proprietà, quali la stabilità, l'accuratezza e la complessità algoritmica. Nel contesto di ogni specifica classe di problemi vengono illustrati gli algoritmi più idonei, ne viene fatta l'analisi teorica e se ne verificano i risultati previsti implementandoli con l'ausilio di programmi in linguaggio MATLAB. Ogni capitolo è integrato da esercizi e temi svolti, questi ultimi corredati da programmi MATLAB. Il volume è indirizzato principalmente agli studenti delle facoltà scientifiche, con particolare attenzione ai corsi di laurea in Ingegneria, Matematica e Scienze dell'Informazione. L'enfasi posta sullo sviluppo di software lo rende interessante anche per ricercatori e utilizzatori delle tecniche del calcolo scientifico nei campi professionali più disparati. La quarta edizione contiene numerose integrazioni in quasi tutti i capitoli. Diverse sezioni sono inoltre state rivisitate con lo scopo di rendere più chiari concetti ed argomenti di considerevole complessità.

Solving Numerical PDEs: Problems, Applications, Exercises - Luca Formaggia 2012-04-05
This book stems from the long standing teaching experience of the authors in the courses on Numerical Methods in Engineering and Numerical Methods for Partial Differential Equations given to undergraduate and graduate students of Politecnico di Milano (Italy), EPFL Lausanne (Switzerland), University of Bergamo (Italy) and Emory University (Atlanta, USA). It aims at introducing students to the numerical approximation of Partial Differential Equations (PDEs). One of the difficulties of this subject is to identify the right trade-off between theoretical concepts and their actual use in practice. With this collection of examples and exercises we try to address this issue by illustrating "academic" examples which focus on basic concepts of Numerical Analysis as well as problems derived from practical application which the student is encouraged to formalize in terms of PDEs, analyze and solve. The latter examples are derived from the experience of the authors in research project developed in collaboration with scientists of different fields (biology, medicine, etc.) and industry. We wanted this book to be useful both to readers more interested in the theoretical aspects and those more concerned with the numerical implementation.

Spectral Theory and Quantum Mechanics - Valter Moretti 2013-04-02
This book pursues the accurate study of the mathematical foundations of Quantum Theories. It may be considered an introductory text on linear functional analysis with a focus on Hilbert spaces. Specific attention is given to spectral theory features that are relevant in physics. Having left the physical phenomenology in the background, it is the formal and logical aspects of the theory that are privileged. Another not lesser purpose is to collect in one place a number of useful rigorous statements on the mathematical structure of Quantum Mechanics, including some elementary, yet fundamental, results on the Algebraic Formulation of Quantum Theories. In the attempt to reach out to Master's or PhD students, both in physics and mathematics, the material is designed to be self-contained: it includes a summary of point-set topology and abstract measure theory, together with an appendix on differential geometry. The book should benefit established researchers to organise and present the

profusion of advanced material disseminated in the literature. Most chapters are accompanied by exercises, many of which are solved explicitly.

Introducción a la matemática numérica - Eduard L. Stiefel 1966

<u>Proceedings of the 5th International Postharvest Symposium</u> - 2005

Computational Methods for PDE in Mechanics - Berardino D'Acunto 2004
- An application-oriented introduction to computational numerical methods for PDE - Complete with numerous exercise sets and solutions - Includes Windows programs in C++ language
Att Återupptäcka Pompeji - Baldassare Conticello 1990

A Primer on PDEs - Sandro Salsa 2013-05-13
This book is designed as an advanced undergraduate or a first-year graduate course for students from various disciplines like applied mathematics, physics, engineering. It has evolved while teaching courses on partial differential equations during the last decade at the Politecnico of Milan. The main purpose of these courses was twofold: on the one hand, to train the students to appreciate the interplay between theory and modelling in problems arising in the applied sciences and on the other hand to give them a solid background for numerical methods, such as finite differences and finite elements.
<u>An Introduction to Mathematical Population Dynamics</u> - Mimmo Iannelli 2015-01-23
This book is an introduction to mathematical biology for students with no experience in biology, but who have some mathematical background. The work is focused on population dynamics and ecology, following a tradition that goes back to Lotka and Volterra, and includes a part devoted to the spread of infectious diseases, a field where mathematical modeling is extremely popular. These themes are used as the area where to understand different types of mathematical modeling and the possible meaning of qualitative agreement of modeling with data. The book also includes a collections of problems designed to approach more advanced questions. This material has been used in the courses at the University of Trento, directed at students in their fourth year of studies in Mathematics. It can also be used as a reference as it provides up-to-date developments in several areas.
Applied Structural and Mechanical Vibrations - Paolo L. Gatti 2014-02-24
The second edition of Applied Structural and Mechanical Vibrations: Theory and Methods continues the first edition's dual focus on the mathematical theory and the practical aspects of engineering vibrations measurement and analysis. This book emphasises the physical concepts, brings together theory and practice, and includes a number of worked-out examples of varying difficulty and an extensive list of references. What's New in the Second Edition: Adds new material on response spectra Includes revised chapters on modal analysis and on probability and statistics Introduces new material on stochastic processes and random vibrations The book explores the theory and methods of engineering vibrations. By also addressing the measurement and analysis of vibrations in real-world applications, it provides and explains the fundamental concepts that form the common background of disciplines such as structural dynamics, mechanical, aerospace, automotive, earthquake, and civil engineering. Applied Structural and Mechanical Vibrations: Theory and Methods presents the material in order of increasing complexity. It introduces the simplest physical systems capable of vibratory motion in the fundamental chapters, and then moves on to a detailed study of the free and forced vibration response of more complex systems. It also explains some of the most important approximate methods and experimental techniques used to model and analyze these systems. With respect to the first edition, all the material has been revised and updated, making it a superb reference for advanced students and professionals working in the field.
Three Dimensional Geophysical Modeling - Andrea Villa 2010
The main object of this thesis is to provide a comprehensive numerical tool forthe three-dimensional simulation of sedimentary basins [94]. Sedimentary basins, in particular salt basins, are the best places to find oil, natural gas and to store dangerous nuclear waste material. The low permeability of salt guarantees low water leakage which is the main concern for the safety of a nuclear waste storage. For this reason one of the best places for a nuclear waste depository is a salt mine. These two applications call for a thorough knowledge of the basin evolution on geological time scales. Until now sedimentary basin studies have been based mainly on geological interpretation: experienced specialists

estimate the history of a basin on the basis of common knowledge. More often, they provide a list of possible scenarios. An appropriate numerical simulator can provide the right tool to choose, among these scenarios, the correct one or, at least, the most realistic.
<u>Partial Differential Equations in Action</u> - Sandro Salsa 2015-05-30
This textbook presents problems and exercises at various levels of difficulty in the following areas: Classical Methods in PDEs (diffusion, waves, transport, potential equations); Basic Functional Analysis and Distribution Theory; Variational Formulation of Elliptic Problems; and Weak Formulation for Parabolic Problems and for the Wave Equation. Thanks to the broad variety of exercises with complete solutions, it can be used in all basic and advanced PDE courses.
Mathematical Analysis II - Claudio Canuto 2015-02-07
The purpose of the volume is to provide a support textbook for a second lecture course on Mathematical Analysis. The contents are organised to suit, in particular, students of Engineering, Computer Science and Physics, all areas in which mathematical tools play a crucial role. The basic notions and methods concerning integral and differential calculus for multivariable functions, series of functions and ordinary differential equations are presented in a manner that elicits critical reading and prompts a hands-on approach to concrete applications. The pedagogical layout echoes the one used in the companion text Mathematical Analysis I. The book's structure has a specifically-designed modular nature, which allows for great flexibility in the preparation of a lecture course on Mathematical Analysis. The style privileges clarity in the exposition and a linear progression through the theory. The material is organised on two levels. The first, reflected in this book, allows students to grasp the essential ideas, familiarise with the corresponding key techniques and find the proofs of the main results. The second level enables the strongly motivated reader to explore further into the subject, by studying also the material contained in the appendices. Definitions are enriched by many examples, which illustrate the properties discussed. A host of solved exercises complete the text, at least half of which guide the reader to the solution. This new edition features additional material with the aim of matching the widest range of educational choices for a second course of Mathematical Analysis.
The Promise of Educational Psychology - Richard E. Mayer 1999
Covering the latest advanced in the field, this brief, easy-to-read introduction to educational psychology focuses on learning and teaching in subject areas and on helping students develop specific cognitive processes that are required to accomplish real academic tasks. Shows how psychological theories and research influence the development of better instructional practices and how real instructional problems influence the development of better psychological theories and research. Deals with the educational psychology of five major subject areas -- reading fluency, reading comprehension, writing, mathematics, and science. Includes three to six major cognitive processes involved in mastering the subject area in each chapter. Analyzes the types of knowledge that are needed to perform academic tasks in the domain in several chapters. Provides concrete examples and connections between cognitive research and practical educational problems. Covers the core advances in educational psychology. For educators at all levels.
Matematica numerica - Alfio Quarteroni 2010-05-30
La Matematica Numerica è elemento fondante del calcolo scientifico. Punto di contatto di diverse discipline nella matematica e nelle moderne scienze applicate, ne diventa strumento di indagine qualitativa e quantitativa. Scopo di questo testo è fornire i fondamenti metodologici della matematica numerica, richiamandone le principali proprietà, quali la stabilità, l'accuratezza e la complessità algoritmica. Nel contesto di ogni specifica classe di problemi vengono illustrati gli algoritmi più idonei, ne viene fatta l'analisi teorica e se ne verificano i risultati previsti implementandoli con ausilio di programmi in linguaggio MATLAB. Il volume è indirizzato principalmente agli studenti delle facoltà scientifiche, con particolare attenzione ai corsi di laurea in Ingegneria, Matematica e Scienze dell'Informazione. L'enfasi posta sullo sviluppo di software lo rende interessante auche per ricercatori e utilizzatori delle tecniche del calcolo scientifico nei campi professionali piú disparati. La terza edizione è caratterizzata da una revisione dei contenuti e dei programmi MATLAB.
<u>Discrete Dynamical Models</u> - Ernesto Salinelli 2014-06-11
This book provides an introduction to the analysis of discrete dynamical systems. The content is presented by an unitary approach that blends the perspective of mathematical modeling together with the ones of several discipline as Mathematical Analysis, Linear Algebra, Numerical Analysis, Systems Theory and Probability. After a preliminary discussion of several

models, the main tools for the study of linear and non-linear scalar dynamical systems are presented, paying particular attention to the stability analysis. Linear difference equations are studied in detail and an elementary introduction of Z and Discrete Fourier Transform is presented. A whole chapter is devoted to the study of bifurcations and chaotic dynamics. One-step vector-valued dynamical systems are the subject of three chapters, where the reader can find the applications to positive systems, Markov chains, networks and search engines. The book is addressed mainly to students in Mathematics, Engineering, Physics, Chemistry, Biology and Economics. The exposition is self-contained: some appendices present prerequisites, algorithms and suggestions for computer simulations. The analysis of several examples is enriched by the proposition of many related exercises of increasing difficulty; in the last chapter the detailed solution is given for most of them.

Groups - Antonio Machì 2012-04-05
Groups are a means of classification, via the group action on a set, but also the object of a classification. How many groups of a given type are there, and how can they be described? Hölder's program for attacking this problem in the case of finite groups is a sort of leitmotiv throughout the text. Infinite groups are also considered, with particular attention to logical and decision problems. Abelian, nilpotent and solvable groups are studied both in the finite and infinite case. Permutation groups and are treated in detail; their relationship with Galois theory is often taken into account. The last two chapters deal with the representation theory of finite group and the cohomology theory of groups; the latter with special emphasis on the extension problem. The sections are followed by exercises; hints to the solution are given, and for most of them a complete solution is provided.

Algebra for Symbolic Computation - Antonio Machi 2012-07-10
This book deals with several topics in algebra useful for computer science applications and the symbolic treatment of algebraic problems, pointing out and discussing their algorithmic nature. The topics covered range from classical results such as the Euclidean algorithm, the Chinese remainder theorem, and polynomial interpolation, to p-adic expansions of rational and algebraic numbers and rational functions, to reach the problem of the polynomial factorisation, especially via Berlekamp's method, and the discrete Fourier transform. Basic algebra concepts are revised in a form suited for implementation on a computer algebra system.

Logic: a Brief Course - Daniele Mundici 2012-03-29
This short book, geared towards undergraduate students of computer science and mathematics, is specifically designed for a first course in mathematical logic. A proof of Gödel's completeness theorem and its main consequences is given using Robinson's completeness theorem and Gödel's compactness theorem for propositional logic. The reader will familiarize himself with many basic ideas and artifacts of mathematical logic: a non-ambiguous syntax, logical equivalence and consequence relation, the Davis-Putnam procedure, Tarski semantics, Herbrand models, the axioms of identity, Skolem normal forms, nonstandard models and, interestingly enough, proofs and refutations viewed as graphic objects. The mathematical prerequisites are minimal: the book is accessible to anybody having some familiarity with proofs by induction. Many exercises on the relationship between natural language and formal proofs make the book also interesting to a wide range of students of philosophy and linguistics.

Revista de la Unión Matemática Argentina y de la Asociación Física Argentina - 1964

Métodos y algoritmos básicos del álgebra numérica - Carlos Conde Lázaro 1990
En este texto se encuentran combinados, con rigos y sencillez excepcionales, los fundamentos de los métodos propios del álgebra lineal para la resolución de sistemas de ecuaciones, los cálculos de vectores y vectores propios, con las técnicas numéricas más adecuadas. También debe resaltarse el desarrollo completo de los algoritmos correspondientes, así como su programación en BASIC, para los numerosos métodos de resolución presentados.

A Textbook on Ordinary Differential Equations - Shair Ahmad 2015-06-05
This book offers readers a primer on the theory and applications of Ordinary Differential Equations. The style used is simple, yet thorough and rigorous. Each chapter ends with a broad set of exercises that range from the routine to the more challenging and thought-provoking. Solutions to selected exercises can be found at the end of the book. The book contains many interesting examples on topics such as electric circuits, the pendulum equation, the logistic equation, the Lotka-Volterra

system, the Laplace Transform, etc., which introduce students to a number of interesting aspects of the theory and applications. The work is mainly intended for students of Mathematics, Physics, Engineering, Computer Science and other areas of the natural and social sciences that use ordinary differential equations, and who have a firm grasp of Calculus and a minimal understanding of the basic concepts used in Linear Algebra. It also studies a few more advanced topics, such as Stability Theory and Boundary Value Problems, which may be suitable for more advanced undergraduate or first-year graduate students. The second edition has been revised to correct minor errata, and features a number of carefully selected new exercises, together with more detailed explanations of some of the topics. A complete Solutions Manual, containing solutions to all the exercises published in the book, is available. Instructors who wish to adopt the book may request the manual by writing directly to one of the authors.

Matematica numerica: metodi, algoritmi e software - Almerico Murli 2007

Mathematical Models and Numerical Simulation in Electromagnetism - Alfredo Bermúdez de Castro 2014-07-22
The book represents a basic support for a master course in electromagnetism oriented to numerical simulation. The main goal of the book is that the reader knows the boundary-value problems of partial differential equations that should be solved in order to perform computer simulation of electromagnetic processes. Moreover it includes a part devoted to electric circuit theory based on ordinary differential equations. The book is mainly oriented to electric engineering applications, going from the general to the specific, namely, from the full Maxwell's equations to the particular cases of electrostatics, direct current, magnetostatics and eddy currents models. Apart from standard exercises related to analytical calculus, the book includes some others oriented to real-life applications solved with MaxFEM free simulation software.

Advances in Bridge Maintenance, Safety Management, and Life-Cycle Performance, Set of Book & CD-ROM - Paulo J. da Sousa Cruz 2015-03-02
Advances in bridge maintenance, safety, management and life-cycle performance contains the papers presented at IABMAS'06, the Third International Conference of the International Association for Bridge Maintenance and Safety (IABMAS), held in Porto, Portugal from 16 to 19 July, 2006.All major aspects of bridge maintenance, management, safety, and co

Introduzione al Calcolo Scientifico - Alfio Quarteroni 2004-04-13
Questo testo h espressamente concepito per i corsi brevi del nuovo ordinamento delle Facolt di Ingegneria e di Scienze. Esso affronta tutti gli argomenti tipici della Matematica Numerica, spaziando dal problema di approssimare una funzione, al calcolo dei suoi zeri, delle sue derivate e del suo integrale definito fino alla risoluzione approssimata di equazioni differenziali ordinarie e di problemi ai limiti. Due capitolisono inoltre dedicati alla risoluzione di sistemi lineari ed al calcolo degli autovalori di una matrice, mentre un capitolo iniziale conduce lo studente ad un rapido ripasso degli argomenti dell'Analisi Matematica di uso frequente nel volume e ad una introduzioneal linguaggio Matlab.I vari argomenti sono volutamente affrontati a livello elementare ed i paragrafi che richiedono maggior impegno sono stati opportunamente contrassegnati. Al fine di rendere maggiormente incisiva la presentazione h stato fatto uso del programma Matlab, tramite il quale si mostra come rendere esecutivi tutti gli algoritmi che via via si introdurranno, oltre a fornire un riscontro quantitativo immediato alla teoria.Vengono inoltre proposti numerosi esercizi, tutti risolti per esteso, ed esempi, anche con riferimento a specifiche applicazioni. I programmi Matlab presenti nel testo si possonoscaricare dalla pagina web mox.polimi.it/qs.Questa terza edizione si differenzia dalla precedente per la presenza di un maggior numero di problemi applicativi e per diverse integrazioni riguardanti la risoluzione di sistemi lineari e non lineari e l'approssimazione di equazioni differenziali ordinarie.
Modelos matemáticos y experimentación numérica -

Mathematical Analysis I - Claudio Canuto 2015-04-08
The purpose of the volume is to provide a support for a first course in Mathematics. The contents are organised to appeal especially to Engineering, Physics and Computer Science students, all areas in which mathematical tools play a crucial role. Basic notions and methods of differential and integral calculus for functions of one real variable are presented in a manner that elicits critical reading and prompts a hands-

on approach to concrete applications. The layout has a specifically-designed modular nature, allowing the instructor to make flexible didactical choices when planning an introductory lecture course. The book may in fact be employed at three levels of depth. At the elementary level the student is supposed to grasp the very essential ideas and familiarise with the corresponding key techniques. Proofs to the main results befit the intermediate level, together with several remarks and complementary notes enhancing the treatise. The last, and farthest-reaching, level requires the additional study of the material contained in the appendices, which enable the strongly motivated reader to explore further into the subject. Definitions and properties are furnished with substantial examples to stimulate the learning process. Over 350 solved exercises complete the text, at least half of which guide the reader to the solution. This new edition features additional material with the aim of matching the widest range of educational choices for a first course of Mathematics.

Rendiconti di matematica e delle sue applicazioni - 2003

Structural optimization through neural networks for the anti-seismic design - Carlo Calledda 2021-03-17
Neural network-based algorithms find numerous applications in different scientific fields and, in particular, in the various areas of engineering. In Civil Engineering, however, there are still few applications of such methods. The purpose of this thesis is to apply the resolution capabilities of artificial neural networks to structural design.

Mathematical Finance: Theory Review and Exercises - Emanuela Rosazza Gianin 2014-02-10
The book collects over 120 exercises on different subjects of Mathematical Finance, including Option Pricing, Risk Theory, and Interest Rate Models. Many of the exercises are solved, while others are only proposed. Every chapter contains an introductory section illustrating the main theoretical results necessary to solve the exercises. The book is intended as an exercise textbook to accompany graduate courses in mathematical finance offered at many universities as part of degree programs in Applied and Industrial Mathematics, Mathematical Engineering, and Quantitative Finance.

Matematica numerica per la grafica - Catterina Dagnino 2015

Curves and Surfaces - M. Abate 2012-06-11
The book provides an introduction to Differential Geometry of Curves and Surfaces. The theory of curves starts with a discussion of possible definitions of the concept of curve, proving in particular the classification of 1-dimensional manifolds. We then present the classical local theory of parametrized plane and space curves (curves in n-dimensional space are discussed in the complementary material): curvature, torsion, Frenet's formulas and the fundamental theorem of the local theory of curves. Then, after a self-contained presentation of degree theory for continuous self-maps of the circumference, we study the global theory of plane curves, introducing winding and rotation numbers, and proving the Jordan curve theorem for curves of class C2, and Hopf theorem on the rotation number of closed simple curves. The local theory of surfaces begins with a comparison of the concept of parametrized (i.e., immersed) surface with the concept of regular (i.e., embedded) surface. We then develop the basic differential geometry of surfaces in R3: definitions,

examples, differentiable maps and functions, tangent vectors (presented both as vectors tangent to curves in the surface and as derivations on germs of differentiable functions; we shall consistently use both approaches in the whole book) and orientation. Next we study the several notions of curvature on a surface, stressing both the geometrical meaning of the objects introduced and the algebraic/analytical methods needed to study them via the Gauss map, up to the proof of Gauss' Teorema Egregium. Then we introduce vector fields on a surface (flow, first integrals, integral curves) and geodesics (definition, basic properties, geodesic curvature, and, in the complementary material, a full proof of minimizing properties of geodesics and of the Hopf-Rinow theorem for surfaces). Then we shall present a proof of the celebrated Gauss-Bonnet theorem, both in its local and in its global form, using basic properties (fully proved in the complementary material) of triangulations of surfaces. As an application, we shall prove the Poincaré-Hopf theorem on zeroes of vector fields. Finally, the last chapter will be devoted to several important results on the global theory of surfaces, like for instance the characterization of surfaces with constant Gaussian curvature, and the orientability of compact surfaces in R3.

Matematica Numerica Esercizi, Laboratori e Progetti - Alfio Quarteroni 2013-12-12
La Matematica Numerica una disciplina che si sviluppa in simbiosi con il calcolatore; essa fa uso di linguaggi di programmazione che consentono di tradurre gli algoritmi in programmi eseguibili. Questo testo si propone di aiutare lo studente nella transizione fra i concetti teorici e metodologici della Matematica Numerica e la loro implementazione al computer. A questo scopo vengono proposti Esercizi teorici da risolvere con carta e penna atti a far comprendere meglio al lettore la teoria, e Laboratori, in cui per un dato problema si debbono scegliere gli algoritmi pi adatti, realizzare un programma in linguaggio MATLAB per la loro implementazione, rappresentare graficamente in maniera idonea i risultati ottenuti dal calcolatore, infine interpretarli ed analizzarli alla luce della teoria. Per ogni Esercizio ed ogni Laboratorio si presenta una risoluzione dettagliata,completata da una ampia discussione critica. Per una migliore fruizione degli argomenti sviluppati, il testo si apre con una introduzione allambiente di programmazione MATLAB. Il testo contiene infine alcuni Progetti. Il primo concerne gli algoritmi di page ranking dei moderni motori di ricerca, il secondo la determinazione del campo elettrico fra due conduttori e il calcolo della capacit di un condensatore, il terzo lo studio di sistemi dinamici oscillanti di grande rilevanza in applicazioni elettroniche e biologiche. Il testo rivolto a studenti dei corsi di laurea in Matematica, Ingegneria, Fisica e Informatica. La seconda edizione stata arricchita con numerosi nuovi Esercizi e Progetti.

Teias matemáticas: frentes na ciência e na sociedade - Maria Paula Martins Serra de Oliveira 2004-05-01
Instrumentos Matemáticos complexos permitiram realizar com sucesso tarefas tão distintas como a programação de um voo a Marte, a previsão de resultados eleitorais, a explicação do funcionamento de alguns mecanismos do sistema nervoso, ou a abordagem crítica de obras de arte e de textos literários. Da Ciência à Sociedade, dos grandes avanços técnicos à solidez de uma argumentação lógica, a Matemática constrói Teias de uma imensa flexibilidade resultante do carácter universal da sua linguagem. Neste livro personalidades de diferentes universos dão o seu testemunho sobre a forma como usam as Teias Matemáticas para tecer a sua própria visão do mundo.