

Topology Homework Solutions

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This textbook explores all of the protocols and technologies essential to IoT communication mechanisms. Geared towards an upper-undergraduate or graduate level class, the book is presented from a perspective of the standard layered architecture with special focus on protocol interaction and functionality. The IoT protocols are presented and classified based on physical, link, network, transport and session/application layer functionality. The author also lets readers understand the impact of the IoT mechanisms on network and device performance with special emphasis on power consumption and computational complexity. Use cases provided throughout provide examples of IoT protocol stacks in action. The book is based on the author's popular class Fundamentals of IoT at Northeastern University. The book includes examples throughout and slides for classroom use. Also included is a "hands-on" section where the topics discussed as theoretical content are built as stacks in the context of an IoT network emulator so readers can experiment. Presents a comprehensive resource of the Internet of Things and its networking and protocols, intended for classroom use; Discusses the main families of networking architectures that rely on the IoT protocols (i.e. LWPAN vs WPAN); Introduces use cases and examples that focus on protocol interaction to build network stacks in addition to a suite of classroom materials including exercises and Q&A.

This book covers the design and optimization of computer networks applying a rigorous optimization methodology, applicable to any network technology. It is organized into two parts. In Part 1 the reader will learn how to model network problems appearing in computer networks as optimization programs, and use optimization theory to give insights on them. Four problem types are addressed systematically – traffic routing, capacity dimensioning, congestion control and topology design. Part 2 targets the design of algorithms that solve network problems like the ones modeled in Part 1. Two main approaches are addressed – gradient-like algorithms inspiring distributed network protocols that dynamically adapt to the network, or cross-layer schemes that coordinate the cooperation among protocols; and those focusing on the design of heuristic algorithms for long term static network design and planning problems. Following a hands-on approach, the reader will have

access to a large set of examples in real-life technologies like IP, wireless and optical networks. Implementations of models and algorithms will be available in the open-source Net2Plan tool from which the user will be able to see how the lessons learned take real form in algorithms, and reuse or execute them to obtain numerical solutions. An accompanying link to the author's own Net2plan software enables readers to produce numerical solutions to a multitude of real-life problems in computer networks (www.net2plan.com).

REA's Essentials provide quick and easy access to critical information in a variety of different fields, ranging from the most basic to the most advanced. As its name implies, these concise, comprehensive study guides summarize the essentials of the field covered. Essentials are helpful when preparing for exams, doing homework and will remain a lasting reference source for students, teachers, and professionals.

Geometry I includes methods of proof, points, lines, planes, angles, congruent angles and line segments, triangles, parallelism, quadrilaterals, geometric inequalities, and geometric proportions and similarity.

Students entering today's engineering fields will find an increased emphasis on practical analysis, design, and control. They must be able to translate their advanced programming abilities and sound theoretical backgrounds into superior problem-solving skills. Electromechanical Systems and Devices facilitates the creation of critical problem-solvin

InfoWorld is targeted to Senior IT professionals. Content is segmented into Channels and Topic Centers. InfoWorld also celebrates people, companies, and projects.

Graph Theory: An Introduction to Proofs, Algorithms, and Applications Graph theory is the study of interactions, conflicts, and connections. The relationship between collections of discrete objects can inform us about the overall network in which they reside, and graph theory can provide an avenue for analysis. This text, for the first undergraduate course, will explore major topics in graph theory from both a theoretical and applied viewpoint. Topics will progress from understanding basic terminology, to addressing computational questions, and finally ending with broad theoretical results. Examples and exercises will guide the reader through this progression, with particular care in strengthening proof techniques and written mathematical explanations. Current applications and exploratory exercises are provided to further the reader's mathematical reasoning and understanding of the relevance of graph theory to the modern world. Features The first chapter introduces graph terminology, mathematical modeling using graphs, and a review of proof techniques featured throughout the book The second chapter investigates three major route problems: eulerian circuits, hamiltonian cycles, and shortest paths. The third chapter focuses entirely on trees – terminology, applications, and theory. Four additional chapters focus around a major graph concept: connectivity, matching, coloring, and planarity. Each chapter brings in a modern application or approach. Hints and Solutions to selected exercises provided at the back of the book. Author Karin R. Saoub is an Associate Professor of Mathematics at Roanoke College in Salem, Virginia. She earned her PhD in mathematics from Arizona State University and BA from Wellesley College. Her research focuses on graph coloring and on-line algorithms applied to tolerance graphs. She is also the author of *A Tour Through Graph Theory*, published by CRC Press.

As its title indicates, this book is intended to serve as a textbook for an introductory course in mathematical analysis. In preliminary form the book has been used in this way at the University of Michigan, Indiana University, and Texas A&M University, and has proved serviceable. In addition to its primary purpose as a textbook for a formal course, however, it is the authors' hope that this book will also prove of value to readers interested in studying mathematical analysis on their own. Indeed, we believe the wealth and variety of examples and exercises will be especially conducive to this end. A word on prerequisites. With what mathematical background might a prospective reader hope to profit from the study of this book? Our conscious intent in writing it was to address the needs of a beginning graduate student in mathematics, or,

to put matters slightly differently, a student who has completed an undergraduate program with a mathematics major. On the other hand, the book is very largely self-contained and should therefore be accessible to a lower classman whose interest in mathematical analysis has already been awakened.

This book provides current information on the top 100 careers. Each career is described in detail, including job duties, training and education requirements, salary, projected job availability, and related occupations. It includes a special section on how to find a job, write a resume and cover letter, and provides tips for effective job interviews.

Quantitative Methods in Reservoir Engineering, Second Edition, brings together the critical aspects of the industry to create more accurate models and better financial forecasts for oil and gas assets. Updated to cover more practical applications related to intelligent infill drilling, optimized well pattern arrangement, water flooding with modern wells, and multiphase flow, this new edition helps reservoir engineers better lay the mathematical foundations for analytical or semi-analytical methods in today's more difficult reservoir engineering applications. Authored by a worldwide expert on computational flow modeling, this reference integrates current mathematical methods to aid in understanding more complex well systems and ultimately guides the engineer to choose the most profitable well path. The book delivers a valuable tool that will keep reservoir engineers up-to-speed in this fast-paced sector of the oil and gas market. Stay competitive with new content on unconventional reservoir simulation Get updated with new material on formation testing and flow simulation for complex well systems and paths Apply methods derived from real-world case studies and calculation examples

This book provides a comprehensive yet easy coverage of ad hoc and sensor networks and fills the gap of existing literature in this growing field. It emphasizes that there is a major interdependence among various layers of the network protocol stack. Contrary to wired or even one-hop cellular networks, the lack of a fixed infrastructure, the inherent mobility, the wireless channel, and the underlying routing mechanism by ad hoc and sensor networks introduce a number of technological challenges that are difficult to address within the boundaries of a single protocol layer. All existing textbooks on the subject often focus on a specific aspect of the technology, and fail to provide critical insights on cross-layer interdependencies. To fully understand these intriguing networks, one need to grasp specific solutions individually, and also the many interdependencies and cross-layer interactions.

This textbook covers the subject of real analysis from the fundamentals up through beginning graduate level. It is appropriate as an introductory course text or a review text for graduate qualifying examinations. Some special features of the text include a thorough discussion of transcendental functions such as trigonometric, logarithmic, and exponential from power series expansions, deducing all important functional properties from the series definitions. The text is written in a user-friendly manner, and includes full solutions to all assigned exercises throughout the text.

Provides a detailed and systematic description of the Method of Moments (Boundary Element Method) for electromagnetic modeling at low frequencies and includes hands-on, application-based MATLAB® modules with user-friendly and intuitive GUI and a highly visualized interactive output. Includes a full-body computational human phantom with over 120 triangular surface meshes

extracted from the Visible Human Project® Female dataset of the National library of Medicine and fully compatible with MATLAB® and major commercial FEM/BEM electromagnetic software simulators. This book covers the basic concepts of computational low-frequency electromagnetics in an application-based format and hones the knowledge of these concepts with hands-on MATLAB® modules. The book is divided into five parts. Part 1 discusses low-frequency electromagnetics, basic theory of triangular surface mesh generation, and computational human phantoms. Part 2 covers electrostatics of conductors and dielectrics, and direct current flow. Linear magnetostatics is analyzed in Part 3. Part 4 examines theory and applications of eddy currents. Finally, Part 5 evaluates nonlinear electrostatics. Application examples included in this book cover all major subjects of low-frequency electromagnetic theory. In addition, this book includes complete or summarized analytical solutions to a large number of quasi-static electromagnetic problems. Each Chapter concludes with a summary of the corresponding MATLAB® modules. Combines fundamental electromagnetic theory and application-oriented computation algorithms in the form of stand alone MATLAB® modules. Makes use of the three-dimensional Method of Moments (MoM) for static and quasistatic electromagnetic problems. Contains a detailed full-body computational human phantom from the Visible Human Project® Female, embedded implant models, and a collection of homogeneous human shells. Low-Frequency Electromagnetic Modeling for Electrical and Biological Systems Using MATLAB® is a resource for electrical and biomedical engineering students and practicing researchers, engineers, and medical doctors working on low-frequency modeling and bioelectromagnetic applications.

This book contains MATLAB programs to demonstrate the numerical algorithms, the analytical approaches, and the physical principles. It starts with single particle, single fluid, and single wave, then the kinetic theory, the transport, the magnetohydrodynamics, and the nonlinear physics. The book emphasizes on the numerical algorithm and the analytical asymptology to tackle problems in plasma physics, and to demonstrate the underlying physics principles by graphical visualization. Students are introduced to the multiple time and multiple space scales as they learn the basic plasma phenomena, and are requested to solve problems with either MATLAB or C++. This book is targeting at the senior and graduate level. The emphasis of this book is to teach students to solve problems from the features and characteristics of the problem itself. It provides the students for the most important learning that is not knowing the solution, but knowing how to figure out the solution.

Due to the enormous impact of mechatronics systems, we encounter mechatronics and micromechatronic systems in our daily activities. Recent trends and novel technologies in engineering have increased the emphasis on integrated analysis, design, and control. This book examines motion devices (actuators, motors, transducers and sensors), power electronics, controllers, and electronic solutions with the main emphasis placed on high-performance mechatronic systems. Analysis, design, optimization, control, and implementation issues, as well as a variety of enabling mechatronic systems and devices, are also covered. The results extend from the scope of mechatronic systems to the modern hardware-software developments, utilizing enabling solutions and placing the integrated system perspectives in favor of consistent engineering solutions. Mechatronics and Control of Electromechanical Systems facilitates comprehensive studies and covers the design aspects of mechatronic systems with high-

performance motion devices. By combining traditional engineering topics and subjects with the latest technologies and developments, new advances are stimulated in design of state-of-the-art mechatronic systems. This book provides a deep understanding of the engineering underpinnings of integrated technologies.

A guide for writing research papers covers such topics as the differences between research papers and term papers, choosing a topic, research sources, and conforming to MLA standards.

"Quick access to the important facts and concepts. Complete overview simply presented, easy to grasp."--Cover.

This user-friendly textbook introduces complex analysis at the beginning graduate or advanced undergraduate level. Unlike other textbooks, it follows Weierstrass' approach, stressing the importance of power series expansions instead of starting with the Cauchy integral formula, an approach that illuminates many important concepts. This view allows readers to quickly obtain and understand many fundamental results of complex analysis, such as the maximum principle, Liouville's theorem, and Schwarz's lemma. The book covers all the essential material on complex analysis, and includes several elegant proofs that were recently discovered. It includes the zipper algorithm for computing conformal maps, as well as a constructive proof of the Riemann mapping theorem, and culminates in a complete proof of the uniformization theorem. Aimed at students with some undergraduate background in real analysis, though not Lebesgue integration, this classroom-tested textbook will teach the skills and intuition necessary to understand this important area of mathematics.

This book contains a collection of articles corresponding to some of the talks delivered at the Foundations of Computational Mathematics conference held at IMPA in Rio de Janeiro in January 1997. Some of the others are published in the December 1996 issue of the Journal of Complexity. Both of these publications were available and distributed at the meeting. Even in this aspect we hope to have achieved a synthesis of the mathematics and computer science cultures as well as of the disciplines. The reaction to the Park City meeting on Mathematics of Numerical Analysis: Real Number Algorithms which was chaired by Steve Smale and had around 275 participants, was very enthusiastic. At the suggestion of Narendra Karmarkar a lunch time meeting of Felipe Cucker, Arieh Iserles, Narendra Karmarkar, Jim Renegar, Mike Shub and Steve Smale decided to try to hold a periodic meeting entitled "Foundations of Computational Mathematics" and to form an organization with the same name whose primary purpose will be to hold the meeting. This is then the first edition of FoCM as such. It has been organized around a small collection of workshops, namely - Systems of algebraic equations and computational algebraic geometry - Homotopy methods and real machines - Information-based complexity - Numerical linear algebra - Approximation and PDEs - Optimization - Differential equations and dynamical systems - Relations to computer science - Vision and related computational tools There were also twelve plenary speakers.

An engagingly-written account of mathematical tools and ideas, this book provides a graduate-level introduction to the mathematics used in research in physics. The first half of the book focuses on the traditional mathematical methods of physics - differential and integral equations, Fourier series and the calculus of variations. The second half contains an introduction to more advanced subjects, including differential geometry, topology and complex variables. The authors' exposition avoids excess rigor whilst explaining subtle but important points often glossed over in more elementary texts. The topics are illustrated at every stage by carefully chosen examples, exercises and problems drawn from realistic physics settings. These make it useful both as a textbook in advanced courses and for self-study.

The book gives an introduction to p -adic numbers from the point of view of number theory, topology, and analysis. Compared to other

books on the subject, its novelty is both a particularly balanced approach to these three points of view and an emphasis on topics accessible to undergraduates. In addition, several topics from real analysis and elementary topology which are not usually covered in undergraduate courses (totally disconnected spaces and Cantor sets, points of discontinuity of maps and the Baire Category Theorem, surjectivity of isometries of compact metric spaces) are also included in the book. They will enhance the reader's understanding of real analysis and intertwine the real and p -adic contexts of the book. The book is based on an advanced undergraduate course given by the author. The choice of the topic was motivated by the internal beauty of the subject of p -adic analysis, an unusual one in the undergraduate curriculum, and abundant opportunities to compare it with its much more familiar real counterpart. The book includes a large number of exercises. Answers, hints, and solutions for most of them appear at the end of the book. Well written, with obvious care for the reader, the book can be successfully used in a topic course or for self-study.

A TeXas Style Introduction to Proof is an IBL textbook designed for a one-semester course on proofs (the “bridge course”) that also introduces TeX as a tool students can use to communicate their work. As befitting “textless” text, the book is, as one reviewer characterized it, “minimal.” Written in an easy-going style, the exposition is just enough to support the activities, and it is clear, concise, and effective. The book is well organized and contains ample carefully selected exercises that are varied, interesting, and probing, without being discouragingly difficult.

A revised guide to the theory and implementation of CMOS analog and digital IC design The fourth edition of CMOS: Circuit Design, Layout, and Simulation is an updated guide to the practical design of both analog and digital integrated circuits. The author—a noted expert on the topic—offers a contemporary review of a wide range of analog/digital circuit blocks including: phase-locked-loops, delta-sigma sensing circuits, voltage/current references, op-amps, the design of data converters, and switching power supplies. CMOS includes discussions that detail the trade-offs and considerations when designing at the transistor-level. The companion website contains numerous examples for many computer-aided design (CAD) tools. Using the website enables readers to recreate, modify, or simulate the design examples presented throughout the book. In addition, the author includes hundreds of end-of-chapter problems to enhance understanding of the content presented. This newly revised edition:

- Provides in-depth coverage of both analog and digital transistor-level design techniques
- Discusses the design of phase- and delay-locked loops, mixed-signal circuits, data converters, and circuit noise
- Explores real-world process parameters, design rules, and layout examples
- Contains a new chapter on Power Electronics

Written for students in electrical and computer engineering and professionals in the field, the fourth edition of CMOS: Circuit Design, Layout, and Simulation is a practical guide to understanding analog and digital transistor-level design theory and techniques.

"Cheryl Beaver, Laurie Burton, Maria Fung, Klay Kruczek, editors"--Cover.

This book is an introduction to manifolds at the beginning graduate level, and accessible to any student who has completed a solid undergraduate degree in mathematics. It contains the essential topological ideas that are needed for the further study of manifolds, particularly in the context of differential geometry, algebraic topology, and related fields. Although this second edition has the same basic structure as the first edition, it has been extensively revised and clarified; not a single page has been left untouched. The major changes include a new introduction to CW complexes (replacing most of the material on simplicial complexes in Chapter 5); expanded treatments of manifolds with boundary, local compactness, group actions, and proper maps;

and a new section on paracompactness.

" . . . that famous pedagogical method whereby one begins with the general and proceeds to the particular only after the student is too confused to understand even that anymore. " Michael Spivak This text was written as an antidote to topology courses such as Spivak It is meant to provide the student with an experience in geomet describes. ric topology. Traditionally, the only topology an undergraduate might see is point-set topology at a fairly abstract level. The next course the average student would take would be a graduate course in algebraic topology, and such courses are commonly very homological in nature, providing quick access to current research, but not developing any intuition or geometric sense. I have tried in this text to provide the undergraduate with a pragmatic introduction to the field, including a sampling from point-set, geometric, and algebraic topology, and trying not to include anything that the student cannot immediately experience. The exercises are to be considered as an integral part of the text and, ideally, should be addressed when they are met, rather than at the end of a block of material. Many of them are quite easy and are intended to give the student practice working with the definitions and digesting the current topic before proceeding. The appendix provides a brief survey of the group theory needed.

Middle school teaching and learning has a distinct pedagogy and curriculum that is grounded in the concept of developmentally appropriate education. This text is designed to meet the very specific professional development needs of future teachers of mathematics in middle school environments. Closely aligned with the NCTM Principles and Standards for School Mathematics, the reader-friendly, interactive format encourages readers to begin developing their own teaching style and making informed decisions about how to approach their future teaching career. A variety of examples establish a broad base of ideas intended to stimulate the formative development of concepts and models that can be employed in the classroom. Readers are encouraged and motivated to become teaching professionals who are lifelong learners. The text offers a wealth of technology-related information and activities; reflective, thought-provoking questions; mathematical challenges; student life-based applications; TAG (tricks-activities-games) sections; and group discussion prompts to stimulate each future teacher's thinking. "Your Turn" sections ask readers to work with middle school students directly in field experience settings. This core text for middle school mathematics methods courses is also appropriate for elementary and secondary mathematics methods courses that address teaching in the middle school grades and as an excellent in-service resource for aspiring or practicing teachers of middle school mathematics as they update their knowledge base. Topics covered in Teaching Middle School Mathematics: *NCTM Principles for School Mathematics; *Representation; *Connections; *Communication; *Reasoning and Proof; *Problem Solving; *Number and Operations; *Measurement; *Data Analysis and Probability; *Algebra in the Middle School Classroom; and *Geometry in the Middle School Classroom.

REA's test preparation book includes two full-length exams with detailed explanations based on official exams released by the administrator of the TASP. Taken by full- and part-time students entering Texas public colleges, universities, or technical institutes, the TASP was designed to ensure that students obtain the skills appropriate to their grade level. Failure to pass any TASP section

will result in the assignment of remedial course work in that subject. However, studying the comprehensive reviews in this book will fully prepare the student to pass each section. Reviews in mathematics, reading skills, and writing skills are presented along with tips and sample problems to help develop reading and writing skills, as well as problem solving ability. All exam sections and review material were prepared by test experts in the educational field to assure their accuracy, difficulty level, and application to the actual examination.

Basic Analysis V: Functional Analysis and Topology introduces graduate students in science to concepts from topology and functional analysis, both linear and nonlinear. It is the fifth book in a series designed to train interested readers how to think properly using mathematical abstractions, and how to use the tools of mathematical analysis in applications. It is important to realize that the most difficult part of applying mathematical reasoning to a new problem domain is choosing the underlying mathematical framework to use on the problem. Once that choice is made, we have many tools we can use to solve the problem. However, a different choice would open up avenues of analysis from a different, perhaps more productive, perspective. In this volume, the nature of these critical choices is discussed using applications involving the immune system and cognition. Features

- Develops a proof of the Jordan Canonical form to show some basic ideas in algebraic topology
- Provides a thorough treatment of topological spaces, finishing with the Krein–Milman theorem
- Discusses topological degree theory (Brouwer, Leray–Schauder, and Coincidence)
- Carefully develops manifolds and functions on manifolds ending with Riemannian metrics

Suitable for advanced students in mathematics and associated disciplines Can be used as a traditional textbook as well as for self-study Author James K. Peterson is an Emeritus Professor at the School of Mathematical and Statistical Sciences, Clemson University. He tries hard to build interesting models of complex phenomena using a blend of mathematics, computation, and science. To this end, he has written four books on how to teach such things to biologists and cognitive scientists. These books grew out of his Calculus for Biologists courses offered to the biology majors from 2007 to 2015. He has taught the analysis courses since he started teaching both at Clemson and at his previous post at Michigan Technological University. In between, he spent time as a senior engineer in various aerospace firms and even did a short stint in a software development company. The problems he was exposed to were very hard, and not amenable to solution using just one approach. Using tools from many branches of mathematics, from many types of computational languages, and from first-principles analysis of natural phenomena was absolutely essential to make progress. In both mathematical and applied areas, students often need to use advanced mathematics tools they have not learned properly. So, he has recently written a series of five books on mathematical analysis to help researchers with the problem of learning new things after they have earned their degrees and are practicing scientists. Along the way, he has also written papers in immunology, cognitive science, and neural network technology, in addition to having grants from the NSF, NASA, and the US Army. He also likes to paint, build furniture, and write stories.

This book is an elementary introduction to geometric topology and its applications to chemistry, molecular biology, and cosmology. It does not assume any mathematical or scientific background, sophistication, or even motivation to study mathematics. It is meant

to be fun and engaging while drawing students in to learn about fundamental topological and geometric ideas. Though the book can be read and enjoyed by nonmathematicians, college students, or even eager high school students, it is intended to be used as an undergraduate textbook. The book is divided into three parts corresponding to the three areas referred to in the title. Part 1 develops techniques that enable two- and three-dimensional creatures to visualize possible shapes for their universe and to use topological and geometric properties to distinguish one such space from another. Part 2 is an introduction to knot theory with an emphasis on invariants. Part 3 presents applications of topology and geometry to molecular symmetries, DNA, and proteins. Each chapter ends with exercises that allow for better understanding of the material. The style of the book is informal and lively. Though all of the definitions and theorems are explicitly stated, they are given in an intuitive rather than a rigorous form, with several hundreds of figures illustrating the exposition. This allows students to develop intuition about topology and geometry without getting bogged down in technical details.

This directory provides detailed profiles of the top 100 graduate schools of business in the United States and abroad. A quick-reference chart presents important comparative data at a glance. In addition, information on admissions, applications procedures, financial aid, the GMAT, and pre-admission advice is given in introductory essays.

The rapid development of information communication technologies (ICTs) is having a profound impact across numerous aspects of social, economic, and cultural activity worldwide, and keeping pace with the associated effects, implications, opportunities, and pitfalls has been challenging to researchers in diverse realms ranging from education to competitive intelligence.

An exceptionally comprehensive treatment of this subject aimed at students in business, management, science, and engineering. Topics include linear, non-linear, integer, and dynamic programming, network analysis, quadratic and separable programming, inventory control, probabilistic methods, and many other topics. Numerous applications.

Topology is a branch of mathematics packed with intriguing concepts, fascinating geometrical objects, and ingenious methods for studying them. The authors have written this textbook to make the material accessible to undergraduate students without requiring extensive prerequisites in upper-level mathematics. The approach is to cultivate the intuitive ideas of continuity, convergence, and connectedness so students can quickly delve into knot theory, the topology of surfaces and three-dimensional manifolds, fixed points and elementary homotopy theory. The fundamental concepts of point-set topology appear at the end of the book when students can see how this level of abstraction provides a sound logical basis for the geometrical ideas that have come before. This organization exposes students to the exciting world of topology now(!) rather than later. Students using this textbook should have some exposure to the geometry of objects in higher-dimensional Euclidean spaces together with an appreciation of precise mathematical definitions and proofs.

There are many bits and pieces of folklore in mathematics that are passed down from advisor to student, or from collaborator to collaborator, but which are too fuzzy and non-rigorous to be discussed in the formal literature. Traditionally, it was a matter of luck and location as to who learned such folklore mathematics. But today, such bits and pieces can be communicated effectively and efficiently via the semiformal medium of research blogging. This book grew from such a blog. In 2007, Terry Tao began a mathematical blog to cover a variety of topics, ranging from his own research and other recent developments in mathematics, to lecture notes for his classes, to non-technical puzzles and

expository articles. The articles from the first year of that blog have already been published by the AMS. The posts from 2008 are being published in two volumes. This book is Part II of the second-year posts, focusing on geometry, topology, and partial differential equations. The major part of the book consists of lecture notes from Tao's course on the Poincaré conjecture and its recent spectacular solution by Perelman. The course incorporates a review of many of the basic concepts and results needed from Riemannian geometry and, to a lesser extent, from parabolic PDE. The aim is to cover in detail the high-level features of the argument, along with selected specific components of that argument, while sketching the remaining elements, with ample references to more complete treatments. The lectures are as self-contained as possible, focusing more on the "big picture" than on technical details. In addition to these lectures, a variety of other topics are discussed, including expository articles on topics such as gauge theory, the Kakeya needle problem, and the Black-Scholes equation. Some selected comments and feedback from blog readers have also been incorporated into the articles. The book is suitable for graduate students and research mathematicians interested in broad exposure to mathematical topics.

Discrete geometry is a relatively new development in pure mathematics, while computational geometry is an emerging area in applications-driven computer science. Their intermingling has yielded exciting advances in recent years, yet what has been lacking until now is an undergraduate textbook that bridges the gap between the two. *Discrete and Computational Geometry* offers a comprehensive yet accessible introduction to this cutting-edge frontier of mathematics and computer science. This book covers traditional topics such as convex hulls, triangulations, and Voronoi diagrams, as well as more recent subjects like pseudotriangulations, curve reconstruction, and locked chains. It also touches on more advanced material, including Dehn invariants, associahedra, quasigeodesics, Morse theory, and the recent resolution of the Poincaré conjecture. Connections to real-world applications are made throughout, and algorithms are presented independently of any programming language. This richly illustrated textbook also features numerous exercises and unsolved problems. The essential introduction to discrete and computational geometry Covers traditional topics as well as new and advanced material Features numerous full-color illustrations, exercises, and unsolved problems Suitable for sophomores in mathematics, computer science, engineering, or physics Rigorous but accessible An online solutions manual is available (for teachers only). To obtain access, please e-mail:

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Topology of Surfaces Springer Science & Business Media

Graduate-level exposition by noted Russian mathematician offers rigorous, readable coverage of classification of equations, hyperbolic equations, elliptic equations, and parabolic equations. Translated from the Russian by A. Shenitzer.

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