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Category theory is a branch of abstract algebra with incredibly diverse applications. This text and reference book is aimed not only at mathematicians, but also researchers and students of computer science, logic, linguistics, cognitive science, philosophy, and any of the other fields in which the ideas are being applied. Containing clear definitions of the essential concepts, illuminated with numerous accessible examples, and providing full proofs of all important propositions and theorems, this book aims to make the basic ideas, theorems, and methods of category theory understandable to this broad readership. Although assuming few mathematical pre-requisites, the standard of mathematical rigour is not compromised. The material covered includes the standard core of categories; functors; natural transformations; equivalence; limits and colimits; functor categories; representables; Yoneda's lemma; adjoints; monads. An extra topic of cartesian closed categories and the lambda-calculus is also provided - a must for computer scientists, logicians and linguists! This Second Edition contains numerous revisions to the original text, including expanding the exposition, revising and elaborating the proofs, providing additional diagrams, correcting typographical errors and, finally, adding an entirely new section on monoidal categories. Nearly a hundred new exercises have also been added, many with solutions, to make the book more useful as a course text and for self-study. 1 CATEGORIES 2 ABSTRACT STRUCTURES 3 DUALITY 4 GROUPS AND CATEGORIES 5 LIMITS AND COLIMITS 6 EXPONENTIALS 7 FUNCTORS AND NATURALITY 8 CATEGORIES OF DIAGRAMS 9 ADJOINTS 10 MONADS AND ALGEBRAS Steve Awodey's GitHub pages View My GitHub Profile This course focuses on applications of category theory in logic. A leading idea is functorial semantics, according to which a model of a logical theory is a set-valued functor on a structured category determined by the theory. This gives rise to a syntax-invariant notion of a logical theory and introduces many algebraic methods into logic, leading naturally to the universal and other general models that distinguish functorial from classical semantics. The lambda-calculus, for example, is treated via cartesian closed categories. Similarly higher-order logic is modelled by the categorical notion of a topos. Using sheaves, topos theory subsumes Kripke semantics for modal and intuitionistic logics. And locally cartesian closed categories provide semantics for dependent type theories. Time permitting, we may consider Martin-Löf of type theory and its recent extension to Homotopy type theory. Prerequisites 80-413/713 Category Theory or equivalent. Topics Functorial semantics for algebraic theories Functorial semantics for elementary logic Higher-order logic and basic topos theory Sheaf semantics and Grothendieck toposes Simple type theory and cartesian closed categories Dependent type theory and locally cartesian closed categories Homotopy type theory Texts Recommended Steve Awodey, Category Theory, 2nd edition, Oxford University Press, 2010. Crole, R. L.: Categories for Types. Cambridge University Press, Cambridge, 1993. Lambek, J. and Scott, P.: Introduction to Higher-Order Categorical Logic. Cambridge University Press, Cambridge, 1996. Mac Lane, S. and Moerdijk, L.: Sheaves in Geometry and Logic: A First Introduction to Topos Theory. Springer, 1992. Supplemental Asperti, A. and Longo, G.: Categories, Types, and Structures. MIT Press, 1991. Barr, M. and Wells, C.: Categories for Computing Science, 3rd edition. Boreaux, F.: Handbook of Categorical Algebra (Encyclopedia of Mathematics and its Applications). Cambridge University Press, 1994. Freyd, P. and Scedrov, A.: Categories, Allegories. North-Holland, 1995. Johnstone, P.: Sketches of an Elephant. Cambridge University Press. Makkai, M. and Reyes, G.: First-Order Categorical Logic. LNM 611, Springer, 1977. Mac Lane, S.: Categories for the Working Mathematician. Springer, 1971. (the standard reference) McLarty, C.: Elementary Categories, Elementary Toposes. Oxford Logic Guides 21, Oxford University Press, 1992. Requirements Grades will be based on 4 problem sets and a presentation in class, with a brief written report. Course materials Course outline Lecture notes Problem sets Watch this space for news and information! Have a look at the first set of lecture notes for a review of basic category theory. Jan 18: Class begins! Meet on zoom for a course overview and some planning. Jan 20: Meet on zoom for a review of category theory, as in the lecture notes. There is a course zulip for announcements and discussion. Posted the first half of the notes on algebraic theories for those who want to work ahead. Added a course outline. The notes on algebraic theories are now complete. The first half of the notes on propositional logic are now online. No class on Tuesday, March 15. Your assignment instead is to watch my tutorial on polynomial functors (both lectures), either live or the recording, in the Topos Institute Polynomial Workshop. The notes on propositional logic are now complete. The first half of the notes on lambda-calculus are now online. The third and final problem set is online. If you haven't chosen a final topic, talk to me about it soon. Students lectures will be in the last week of the semester, 4/26,28. The notes on lambda-calculus are now complete. Hosted on GitHub Pages — Theme by orderedlist Second Edition Steve Awodey June 2010 ISBN: 9780199237180 336 pages Paperback 234x156mm In Stock Oxford Logic Guides Price: £45.49 A comprehensive reference to category theory for students and researchers in mathematics, computer science, logic, cognitive science, linguistics, and philosophy. Useful for self-study and as a course text, the book includes all basic definitions and theorems (with full proofs), as well as numerous examples and exercises. Description About the Author(s) Table of Contents Reviews A comprehensive reference to category theory for students and researchers in mathematics, computer science, logic, cognitive science, linguistics, and philosophy. Useful for self-study and as a course text, the book includes all basic definitions and theorems (with full proofs), as well as numerous examples and exercises. Important growing area of mathematics Clear definitions of all basic concepts Combines rigour with an appealing informality Contains precise statements of all essential theorems, with full proofs of all theorems, propositions and lemmas Based on courses given at Carnegie Mellon University Numerous exercises provided New to this edition Nearly a hundred new exercises Many more examples and diagrams Worked solutions to almost half the exercises New coverage of monoidal categories Steve Awodey, Carnegie Mellon University, USA Table of Contents Preface 1:Categories 2:Abstract Structures 3:Duality 4:Groups and Categories 5:Limits and Colimits 6:Exponentials 7:Naturality 8:Categories of Diagrams 9:Adjoints 10:Monads and Algebras References Solutions to Selected Exercises Index "The book is well organised and very well written. The presentation of the material is from the concrete to the abstract, proofs are worked out in detail and the examples and the exercises spread throughout the text mark a pleasant rhythm for its reading. In all, Awodey's Category Theory is a very nice and recommendable introduction to the subject." - Pere Pascual, EMS Newsletter This text provides a comprehensive reference to category theory, containing exercises, for researchers and graduates in philosophy, mathematics, computer science, logic and cognitive science. The basic definitions, theorems, and proofs are made accessible by assuming few mathematical pre-requisites but without compromising mathematical rigour. ;This text and reference book on Category Theory, a branch of abstract algebra, is aimed not only at students of Mathematics, but also researchers and students of Computer Science, Logic, Linguistics, Cognitive Science, Philosophy, and any of the other fields that now make use of it. Containing clear definitions of the essential concepts, illuminated with numerous accessible examples, and providing full proofs of all important propositions and theorems, this book aims to make the basic ideas, theorems, and methods of Category Theory understandable to this broad readership. Although it assumes few mathematical pre-requisites, the standard of mathematical rigour is not compromised. The material covered includes the standard core of categories; functors; natural transformations; equivalence; limits and colimits; functor categories; representables; Yoneda's lemma; adjoints; monads. An extra topic of cartesian closed categories and the lambda-calculus is also provided; a must for computer scientists, logicians and linguists! Showing 1-30 Start your review of Category Theory Jul 21, 2017 Sandor Molnar rated it it was amazing The definitive starting point So, if you are as into category theory as I am, I'd suggest to go through this one first. Clear, understandable, containing loads of examples and exercises to grasp the basics. After this you may embark on Saunders' book. After all, Awodey was a doctoral student of Saunders'. ...more Liudmila rated it it was amazing Jan 21, 2019 Joseph Lee rated it really liked it Feb 15, 2013 Mateusz rated it liked it Dec 02, 2015 Daniel rated it really liked it Feb 01, 2008 Дарья rated it really liked it Dec 10, 2014 Aleksis rated it really liked it Oct 28, 2015 irene rated it really liked it Sep 28, 2020 Hao rated it liked it Jul 08, 2017 Gu Yifei rated it really liked it May 31, 2022 Shu Tanaka rated it really liked it Nov 07, 2017 M R rated it really liked it Apr 08, 2021 Raiyan Ahsan rated it it was amazing Oct 27, 2019 John Quigg rated it really liked it Dec 20, 2014 Rudolf Kuhlavy rated it really liked it Aug 15, 2020 Alexandre Guay rated it really liked it Dec 10, 2013 Mark Moon rated it really liked it Jul 01, 2014 John rated it really liked it Jan 21, 2015 Andrei rated it really liked it Jul 01, 2013 John Wiegley rated it really liked it Dec 11, 2016 Liudmila rated it it was amazing Jan 21, 2019



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