Preface

Note. The text book, *Introduction to Knot Theory* in the Graduate Texts in Mathematics series, # 175, NY: Springer-Verlag (1997), is authored by W. B. Raymond Lickorish, Professor of Geometric Topology at the University of Cambridge. His approach is to consider knot theory as a part of geometric topology. He describes his goals as (see page v): "The aim will be to find invariants that distinguish knots, to investigate geometric properties of knots and to see something of the way they interact with more adventurous three-dimensional topology." The book is based on lecture notes for a graduate course given at the University of Cambridge, so don't let the title mislead you!

W. B. R. Lickorish (February 19, 1938–present) in 1974; photo from the Wikipedia page for W. B. R. Lickorish

Note. The prerequisite knowledge for this book is "very basic knowledge of the fundamental group and of a simply homology theory." In these notes, we give references to either online notes or other text books.

Note. The main techniques addressed in this book include the 3-manifold method of manipulating surfaces based on the simple closed curves in which two surfaces intersect. This technique leads to results on prime knots, unique factorization, and the primeness of alternating diagrams. A second technique is the combinatorial method. This allows us to consider knot and link diagrams, Kauffmann brackets, and the Jones polynomial. A third technique involves homology theory which allows us to address the Alexander polynomial, the Conway polynomial, and the fundamental group of the complement of a knot or link. In the process, the "surgery" of 3-manifolds is explored.

Note. On page vii, Lickorish states that "it is intended that everything should be proved!" However (as he states on page vi), some basic results from piecewise linear theory will sometimes be quoted, but only a sketch of the proof. Some of this is necessary to prevent diagrams with infinitely many crossings (so-called "wild knots").

Note. In terms of background material, you might find my online notes for Introduction to Knot Theory useful. Though very informal with rather "loose" proofs, the vocabulary of knot theory and concrete examples are given. Online class notes for Introduction to Topology (MATH 4357/5357) are available. These are based on James R. Munkres' *Topology*, 2nd Edition, Upper Saddle River, NJ: Prentice Hall, Inc. (2000). This book also contains relevant material on The Seifert-van Kampen Theorem (Chapter 11) and The Classification of Surfaces (Chapter 12).

These ideas fall under the general area of algebraic topology. A list of the chapters in Munkres on these topics is at Introduction to Topology Class Notes, Algebraic Topology (though notes for these sections are only partially available at this time [spring 2021]).

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