

# The Zakon Series on Mathematical Analysis

---

**Basic Concepts of Mathematics**

**Mathematical Analysis I**

**Mathematical Analysis II**



9 781931 705004



The Zakon Series on Mathematical Analysis

---

**Basic Concepts of**  
**Mathematics**

**Elias Zakon**

University of Windsor

---

The Trillia Group



West Lafayette, IN

## Copyright Notice

Basic Concepts of Mathematics

© 1973 Elias Zakon

© 2001 Bradley J. Lucier and Tamara Zakon

Distributed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International ([CC BY-NC-ND 4.0](https://creativecommons.org/licenses/by-nc-nd/4.0/)) Public License. Informally, this license allows you to:

**Share:** copy and redistribute the material in any medium or format

under the following conditions:

**Attribution:** You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

**NonCommercial:** You may not use the material for commercial purposes.

**NoDerivatives:** If you remix, transform, or build upon the material, you may not distribute the modified material.

**No additional restrictions:** You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.

Full license terms can be viewed at:

<http://creativecommons.org/licenses/by-nc-nd/4.0/legalcode>.

If you would like more rights to this work (e.g., commercial publication rights or including parts of this work in another work, etc.), please contact the publisher.

Published by The Trillia Group, West Lafayette, Indiana, USA

ISBN 978-1-931705-00-3

First published: May 26, 2001. This version released: February 3, 2014.

Technical Typist: Judy Mitchell. Copy Editor: John Spiegelman. Logo: Miriam Bogdanic.

The phrase “The Trillia Group” and The Trillia Group logo are trademarks of [The Trillia Group](#) and may not be used without permission.

This book was prepared by Bradley J. Lucier and Tamara Zakon from a manuscript prepared by Elias Zakon. We intend to correct and update this work as needed. If you notice any mistakes in this work, please send e-mail to [lucier@math.purdue.edu](mailto:lucier@math.purdue.edu) and they will be corrected in a later version.

# Contents\*

<b>Preface</b>	<b>vii</b>
<b>About the Author</b>	<b>ix</b>
<b>Chapter 1. Some Set Theoretical Notions</b>	<b>1</b>
1. Introduction. Sets and their Elements . . . . .	1
2. Operations on Sets . . . . .	3
Problems in Set Theory . . . . .	9
3. Logical Quantifiers . . . . .	12
4. Relations (Correspondences) . . . . .	14
Problems in the Theory of Relations . . . . .	19
5. Mappings . . . . .	22
Problems on Mappings . . . . .	26
*6. Composition of Relations and Mappings . . . . .	28
Problems on the Composition of Relations . . . . .	30
*7. Equivalence Relations . . . . .	32
Problems on Equivalence Relations . . . . .	35
8. Sequences . . . . .	37
Problems on Sequences . . . . .	42
*9. Some Theorems on Countable Sets . . . . .	44
Problems on Countable and Uncountable Sets . . . . .	48
<b>Chapter 2. The Real Number System</b>	<b>51</b>
1. Introduction . . . . .	51
2. Axioms of an Ordered Field . . . . .	52
3. Arithmetic Operations in a Field . . . . .	55
4. Inequalities in an Ordered Field. Absolute Values . . . . .	58
Problems on Arithmetic Operations and Inequalities in a Field . . . . .	62
5. Natural Numbers. Induction . . . . .	63
6. Induction (continued) . . . . .	68
Problems on Natural Numbers and Induction . . . . .	71
7. Integers and Rationals . . . . .	74
Problems on Integers and Rationals . . . . .	76
8. Bounded Sets in an Ordered Field . . . . .	77

---

\* “Starred” sections may be omitted by beginners.

[Click here to download full PDF material](#)