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The Root of Mathematics

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The Root of Mathematics

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Abstract

This document is a node in the Laplacian Society archives, the position of which is defined above. It thus gathers the knowledge detailed in its roots and extends it further. This particular document acts as the root of mathematical knowledge constructed by the society. This is where mathematics begins.

0.1 Preliminaries

This PDF is a root document. Hence, there are no preliminaries.

0.2 Protractions

See the Directions to Study Mathematics heading for directions on courses available to follow.

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1 Introduction

You've made it! This is where our mathematical journey begins. Here, in this introduction, we discuss a few philosophical concerns and our goals. Later in the document, we describe trajectories that the new-coming reader may take, finding their way to their desired topic.

In our mathematics, we do not seek to replace texts that have already been written. Instead, we would like to draw a map. Proofs to us are vital. There is emphasis on them, their beauty, and the philosophy beneath them. What makes mathematics so special lies within the works of these proofs. What is the nature of mathematics? Is it embedded within our universe, for us to finally discover, or some system of thought we have simply invented? That is a worthy discussion. What particularly is so particular about mathematics, making it such a singularly powerful system?

For the sake of it, we want to prove everything as we go, leaving no proof-stone unturned. For this purpose, we need a way of notating proofs differently to the convention. The convention in modern texts is to use human language - English, for example - and write the symbols in-between. Very often, proofs are presented as finalised works of art. While there is definitely an elegance to this form, and yes, while proofs put this way are definitely works of art to be appreciated, we want to watch the painting process. It is thus the way we work to uncover these proofs the old way - by digging for them. We want intuition aside the knowledge.

Having said that, it is impossible to recreate the discovery or inventive (you pick which is right) process in the act of writing. The process is something the student must themselves embark upon. That is the only way. We thus too collect problems to be solved, as well as a system for finding problems in the first place. But above (or beneath) all these systems, derivations, proofs, processes or what not, lies the fundamental source of creativity, where we reside and currently hold the mantle. Mathematics may be embedded within the universal evolutionary process, but we are the only subjects of said process that we know have come to know of it. That is our honour, and our responsibility.

1.1 The PDF Web-Tree

Every PDF begins with a standard first few pages, describing the necessary official detail. Next, the PDF will describe its prerequisite knowledge, as it will need to borrow results previously constructed so as to not be redundant. Our PDFs build off of one another. We will not repeat proofs if we do not need to, and will reference the PDF that the proof is found when we state a theorem.

Once the preliminaries are stated, as well as the main sources of our work, we get on with constructed the PDF mathematics. We are not trying to rewrite any textbooks. Rather, we wish to construct the mathematics in our preferred style, often adding explanations for the purpose of intuition, writing for the sake of our own learning as well and the ease of learning for you, our dear reader. Of course, please see the listed textbooks and other sources per PDF or per section to get a far richer material. Often, we are summarising and adding our own explanation, constructing in different order, according to our purposes. Hence, we are not replicating or replacing any of the sources we use. These PDFs are meant to supplement your learning, as well as ours.

1.2 Notations

Each PDF should have its notations defined somewhere in its introductory section. We will not prescribe any notations here, since the need for different notations arise in the study of different topics. Hence, you should expect the notations to change accordingly per PDF.

1.3 Series of PDFs

Often we will make series of PDFs, which can in some way be thought of as parts of a larger node in the mathematics tree. But there are reasons for making a series, which can be envisioned as a straight line of connected nodes in the tree. These should be apparent in context.

1.4 Using Tiers or Levels

It is impractical for us to pretend that knowledge can neatly be constructed in a tree-like fashion. Knowledge is deeply interconnects, more like a web that anything else. But since we like to think of it as a tree, for the way that it builds, from its roots to its leaves, the forefront of knowledge, we will use tree interchangeably with web, depending on the context.

The use of tiers is important. In our tree, nodes (PDFs) can have multiple parents. We will make use of tier PDFs that we use as a hub along the way up the tree. We will try our best to place topics in appropriate tiers, such that a student may be able to follow a course of study in a sort-of grade-based system.

2 Contact and Connections

For any enquiries at all, find usthelaplaciansociety@gmail.com

3 Management of the PDF

- Director: Shaun G. Schoeman

4 Directions to Join, Contribute, or Donate

5 Directions to Study Mathematics

We have the following PDFs planned for you to follow, should you be interested. We list the topics of study under tier levels. Note that much of the work is in progress, and most of these PDFs are unavailable as they are not yet written to any adequate extent.

5.1 A List of Books

This list was taken from YouTube :: Learn Mathematics from START to FINISH; by The Math Sorcerer.

1. Discrete Mathematics with Applications by Susanna Epp
2. Discrete Mathematical Structures by Kolman, Busby, and Ross
3. Mathematical Proofs: A Transition to Advanced Mathematics by Chartrand, Polimeni, and Zhang
4. An Introduction to Abstract Mathematics by Bond and Keane
5. AGS Pre-Algebra
6. Fearon's Pre-Algebra
7. College Algebra by Kaufmann
8. College Algebra by Blitzer
9. A Graphical Approach to Algebra and Trigonometry by Hornsby, Lial, and Rockswold
10. Calculus by James Stewart
11. Calculus by Michael Spivak
12. A First Course in Differential Equations by Zill
13. Ordinary Differential Equations with Applications by Andrews
14. Elementary Linear Algebra by Howard Anton

15. Linear Algebra by Friedgber, Insel, and Spence
16. Mathematical Statistics by Wackerly, Mendenhall, and Scheaffer
17. A First Course in Probability by Ross
18. Fundamentals of Complex Analysis by Saff and Snider
19. Complex Variables and Applications by Brown and Churchill
20. Analysis 1 and Analysis 2 by Terrance Tao
21. Advanced Calculus by Fitzpatrick
22. Principles of Mathematical Analysis by Rudin
23. Elements of Analysis by Ross
24. Abstract Algebra by Saracino
25. Contemporary Abstract Algebra by Gallian
26. Introduction to Topology by Gamelin and Greene
27. Applied Combinatorics by Tucker
28. Naive Set Theory by Halmos
29. Functional Analysis by Kreyszig
30. Graph Theory by Gould
31. Real Analysis by Royden
32. Real and Complex Analysis by Rudin
33. Linear Algebra by Lang
34. Linear Algebra by Hoffman and Kunze
35. Algebra by Artin
36. Calculus Made Easy by Thompson
37. Geometry by Jurgensen
38. Schaum's Linear Algebra
39. Linear Algebra by Strang

5.2 List of Planned PDFs

1. Elementary Mathematics
    - Counting and Numeracy
    - Level 1 Algebra
    - Level 2 Algebra
    - Elementary Geometry
    - Basic Financial Mathematics
    - Level 3 Algebra
    - Mathematics of Change

2. Tier 1 Mathematics
    - Proof Theory Tier 1
    - Differential Calculus
    - Integral Calculus
    - Vector Calculus Tier 1
    - Dynamics Tier 1
3. Tier 2 Mathematics
    - Introductory Algebra
    - Linear Algebra
    - Ordinary Differential Equations
    - Vector Calculus Tier 2
    - Advanced Calculus
    - Nonlinear Dynamics
    - Boundary Problems
    - Real Analysis
    - Numerical Analysis
4. Financial Mathematics
    - Computational Finance