Daniel's H3 Mathematics Notes

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To poki.

Abstract

This is my H3 Mathematics notes. This paper is nothing less than a re-formatting of Dr Jonathon Teo's H3 Slides in 2025. The contents therefore are not original to the author.

1 Nomenclature and Notations

- $\mathbb{Z}$ denotes the set of integers.
- $\mathbb{Z}^+$ denotes the set of positive integers.
- $\mathbb{N}$ denotes the set of natural numbers.
- $\mathbb{Q}$ denotes the set of rational numbers.
- $\varnothing$ denotes the empty set.

2 Mathematical Statements

2.1 Structure

2.1.1 Conditional Statements

2.1.2 Biconditional Statements

2.1.3 Existential Statements

2.2 Content

A (mathematical) definition is a (true) mathematical statement that gives the precise meaning of a word or phrase that represents some object, property or other concepts.

A theorem is a true mathematical statement that can be proven mathematically.

An axiom is a mathematical statement that does not require proof.

3 Proofs

A (mathematical) proof is a deductive argument for a mathematical statement, showing that the stated assumptions logically guarantee the conclusion.

$$P \xRightarrow{\text{definitions, axioms, algebraic manipulations, and previously established facts}} Q$$

3.1 Direct Proof

A direct proof is an approach to prove a conditional statement $P \Rightarrow Q$.