The Big Book of Real Analysis - Johar
Notes

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Preface

Part I

Chapter 1

Logic and Sets

1.1 Introduction to Logic

Mathematical statements (often called propositions) require proof to be determined if true or false conditional to some definitions or axioms accepted to be true. Mathematical proofs require base level axioms as opposed to absolute truths.

Remark 1.1.1. This is left empty

1.1.1 And, Or, Not

Combinations of mathematical statements can be made or manipulated to create new ones. Negation is done by writing the opposite of a statement. With statements P and Q, they can be combined with "and" or "or", "and" is called a logical conjunction and "or" is called a logical disjunction. The combination of statements is called a compound statement whose truth can be deduced as well.

Example 1.1.2. Consider

$$P : \text{A is a vowel}, \quad \text{and} \quad Q : \text{B is a vowel}$$

We know that P is true and Q is false.

1. Negating each statement results in

$$\neg P : \text{A is not a vowel}, \quad \text{and} \quad \neg Q : \text{B is not a vowel}$$

   Which results in $\neg P$ being false and $\neg Q$ true. Negation switches the truth of a statement.

2. Looking at "and" and "or":

   (a) The "and" connective is denoted with $\wedge$. $P \wedge Q$ says "A is a vowel and B is a vowel", this is false because both statements need to be true in order for the compound statement to be true.

   (b) The "or" connective is denoted with $\vee$. $P \vee Q$ says "A is a vowel or B is a vowel (or both)". This is true because either one of the statements needs to be true or both.

Remark 1.1.3. This is left empty

Example 1.1.4. Consider

$$P : \text{Lucy likes coffee} \quad \text{and} \quad Q : \text{Lucy likes tea}$$

Part II

Part III