



DEDUCTIONS

Why

We want to make conclusions.

Discussion

A *conclusion* is a statement that holds necessarily as a consequence of other statements. We have a list of quantified logical statements, and we call them *premisses*. We want to state which other statements hold necessarily if the premisses hold. A sequence of statements, each of which follows from the previous, ending with a *conclusion* is called a *proof* of the conclusion. The process is *deduction*. A *deduction* is a statement which follows necessarily from other premisses.

A *proposition* is another term for a statement. An unproven statement (or premiss) is also called a *principle*. We will often set apart propositions and principles from the text. We bold them and label them with Arabic numerals (see **Letters**) to enable us to reference them.

Examples

Since principles have no proofs, they will look like

Principle 1. (*Here is where the statement would go*).

Since propositions have proofs, but are used like principles, they will appear stated first, and followed by their proof.

Proposition 1. (*Here is where the statement would go*).

Proof. (Here is the where the account would go). □

Methods of Proof

We outline a few of the methods of proof used in this text.

Forward Reasoning

If we have as premisses that a statement P implies a statement Q , and we have P , then we have Q . It is common that this reasoning is done in chains. P implies Q , and Q implies R . So if we have P then we have Q and if we have Q then we have R . So in other words, we can also deduce that P implies R .

Contradiction

A contradiction occurs when we can deduce a statement and its opposite from the same premisses. If we can deduce a contradiction when we append to a list of premisses a given premiss we can conclude that the given premiss is false.

Terms

To make propositions and principles easy to state, we will often introduce new terms. Doing so is a process of *definition*. These definitions are abbreviations for more complicated to explain objects or properties of objects. They are made to give us language and to save space. When we are defining a term, we will put it in italics.

