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PHILOS 12A / DIS 102

GSI: Mathias Boehm

Problem Set #7

Exercise 8.1

1. *Affirming the Consequent*: From $A \rightarrow B$ and B, infer A. - **Invalid**

2. *Modus Tollens*: From $A \rightarrow B$ and $\neg B$, infer $\neg A$. - **Valid**

3. *Strengthening the Antecedent*: From $B \rightarrow C$, infer $(A \wedge B) \rightarrow C$. – **Valid**

4. *Weakening the Antecedent*: From $B \rightarrow C$, infer $(A \vee B) \rightarrow C$. - **Invalid**

5. *Strengthening the Consequent*: From $A \rightarrow B$, infer $A \rightarrow (B \wedge C)$. – **Invalid**

6. *Weakening the Consequent*: From $A \rightarrow B$, infer $A \rightarrow (B \vee C)$. - **Valid**

7. *Constructive Dilemma*: From $A \vee B$, $A \rightarrow C$, and $B \rightarrow D$, infer $C \vee D$. - **Valid**

8. *Transitivity of the Biconditional*: From $A \leftrightarrow B$ and $B \leftrightarrow C$, infer $A \leftrightarrow C$. – **Valid**

Exercise 8.6

The proof starts with A being either a Large Tetrahedron or a Small Cube. There are only two possible shapes and two possible sizes for A. In the second statement, B being Small is an eliminated choice, so B will either be Medium or Large. The third statement is an "if… then" statement explaining that if A is a Tetrahedron or a Cube, then B is Large or Small. From modus ponens, it can be established that B is Large because A will either be a Tetrahedron or a Cube based on the first statement. This information is crucial because of the last statement before the conclusion. It states that A is a Tetrahedron only if B is Medium. Since B is Large and not Medium, then A is not a Tetrahedron via biconditional elimination. As a result, it can be stated that A is a Small Cube and B is Large. The conclusion is A is Small and B is Large. The proof ends.

Exercise 8.14

To get to Irrational(x) → Irrational($\sqrt{x}$), the proof will start with using the proof of contrapositive. If ($\sqrt{x}$ is rational, then that would also mean that x is rational. As a result of that, ($\sqrt{x} = \frac{m}{n}$) can be obtained. M can be any number, and N can be any number except for zero. Squaring both sides would result in ($x = \frac{m^2}{n^2}$). This is rational because m^2 is an integer and n^2 is also an integer. Every square of a number is rational, so this would also prove through the contrapositive proof that if Irrational(x) → Irrational($\sqrt{x}$).