

Logic

Tutorial 3 - Logical Equivalence

24 October 2019

Exercises

1. Show that $(X \wedge Y) \Rightarrow Z$ et $X \Rightarrow (Y \Rightarrow Z)$ are logically equivalent.
2. Let A, B, X and Y be formulas. If $A \models B$, what can you say, in general, about
 - $C \triangleq X \Rightarrow (A \Rightarrow Y)$
 - $D \triangleq X \Rightarrow (B \Rightarrow Y)$

($C \models D$? $D \models C$? $C \leftrightarrow D$? No logical consequence?)
3. Let A, B, X and Y be formulas. If $A \models B$, what can you say, in general, about
 - $C \triangleq \neg(X \Rightarrow A) \vee Y$
 - $D \triangleq \neg(X \Rightarrow B) \vee Y$
4. Let A, B, X and Y be formulas. If $A \models B$, what can you say, in general, about
 - $C \triangleq X \Rightarrow (A \equiv Y)$
 - $D \triangleq X \Rightarrow (B \equiv Y)$
5. Let A, B, X and Y be formulas. If $A \models B$, what can you say, in general, about
 - $C \triangleq X \Rightarrow (\neg A \wedge Y)$
 - $D \triangleq X \Rightarrow (\neg B \wedge Y)$
6. Consider a set of five propositional variables $P \triangleq \{a, b, c, d, e\}$.

- (a) How many formulas, up to logical equivalence, exist that are satisfied by exactly seventeen interpretations?
- (b) How many formulas, up to logical equivalence, exist that are logical consequence of the formula $a \wedge b$?