Peergrade #1

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September 6, 2019

Exercise 1. 1. *Prove in natural deduction for the following proposition:*

$$(\neg A \vee \neg B) \rightarrow (C \rightarrow (A \wedge B)) \rightarrow \neg C$$

Hint: as an intermediate step, prove a contradiction on $A \wedge B$ (with the $\neg E$ rule).

2. *Construct a truth table for the proposition of point 1.*

Exercise 2. *Express each of these statements using quantifiers, using mathematical notation when appropriate. Then form the negation of the statement so that no negation is to the left of a quantifier. Next, express the negation in simple English. (Do not simply use the phrase "It is not the case that.")*

1. *There are tables that don't have legs.*
2. *For any even integer, its square is also even.*
3. *There is a house with pink doors.*
4. *All the pigs can fly and dance.*
5. *There is a rational number whose square root is 2.*

Exercise 3. *Prove in natural deduction the following predicate:*

$$\forall x\ (A(x) \rightarrow B(x)) \rightarrow \exists y\ (\neg B(y)) \rightarrow \neg \forall z\ (A(z))$$