

Exercise 5: Logics

Deadline exercise 5: Monday Dec. 10th, 08.00

Propositional logics:

The following exercises can be shown using either natural deduction or truth tables. Make sure you understand both principles.

1. Show that $A \models \neg\neg A$
2. Show that $\neg\neg A \models A$ without using double negation elimination
3. Show that $A \wedge \neg A \models \perp$
4. Show that $A \rightarrow B, B \rightarrow C \models A \rightarrow C$
5. Show that $A \rightarrow B, \neg B \models \neg A$
6. Show that $A \vee B, \neg A \models B$ (hint: use $\vee E$ to derive \perp)
7. Show that $\neg(A \vee B) \models \neg A \wedge \neg B$
8. Show that $A \rightarrow B \models \neg B \rightarrow \neg A$
9. Show that $(A \rightarrow B) \wedge (C \rightarrow D) \models (A \vee C) \rightarrow (B \vee D)$

First order predicate logics:

Translate the following sentences into FOPL. You need to define your own predicates.

1. "Rufus is a cat"
2. "All bachelors are not married"
3. "Everyone has a mother"
4. "All children of Mary are boys"
5. "No problems can be solved"
6. "There do not exist any smart logician"
7. "There exist pears that have the same color as some pear"
8. "No athlete made a high jump above 2.45"
9. "Rufus has a friend which is a dog but no friends that are cats"