

Semantic Web
Winter Term 2019/20
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Model Theory and Reasoning

Exercise 1 (FOL: Entailment + Tableau) For the following pairs F and G of formulas, check whether one implies the other (if not, give a counterexample), and whether they are equivalent.

Solve the questions first by thinking, and then prove by using the tableau calculus.

- a) $F = (\forall x : p(x)) \vee (\forall x : q(x))$, $G = \forall v : (p(v) \vee q(v))$.
- b) $F = \forall x : ((\exists y : p(y)) \rightarrow q(x))$, $G = \forall v, w : (p(v) \rightarrow q(w))$.
- c) $F = \forall x \exists y : p(x, y)$, $G = \exists w \forall v : p(v, w)$.

Exercise 2 (FOL: Erfüllbarkeit/Satisfiability + Tableau) Consider the formula

$$F = \forall x : (p(x) \wedge \exists y (r(x, y) \wedge \neg p(y)))$$

Is it satisfiable or not?

Prove your decision by the tableau calculus