

**Semantic Web**  
**Summer Term 2017**  
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## Model Theory and Reasoning

Discussion by 15./17.5.2017

**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