Semantic Notions

The central logical notions of validity, entailment, and satisfiability are defined the same way for second-order logic as they are for first-order logic, except that the underlying satisfaction relation is now that for second-order formulas. A second-order sentence, of course, is a formula in which all variables, including predicate and function variables, are bound.

**Definition syn.1 (Validity).** A sentence \( \varphi \) is valid, \( \models \varphi \), iff \( M \models \varphi \) for every structure \( M \).

**Definition syn.2 (Entailment).** A set of sentences \( \Gamma \) entails a sentence \( \varphi \), \( \Gamma \models \varphi \), iff for every structure \( M \) with \( M \models \Gamma \), \( M \models \varphi \).

**Definition syn.3 (Satisfiability).** A set of sentences \( \Gamma \) is satisfiable if \( M \models \Gamma \) for some structure \( M \). If \( \Gamma \) is not satisfiable it is called unsatisfiable.

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Bibliography