2018年8月8日 星期三

Discrete Math 2018

problem set 3

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1. Describe reflexivity axiom, substitution axiom schema and substitution rule.
2. Use axioms in problem 1 to show $\forall x \forall y : (x = y \rightarrow y = x)$
3. Let ∃!x P(x) denote “there exists a unique such that P(x)”. Give three different versions to expand ∃!x P(x).
4. Consider the following two axioms the two axioms.

   ① ∀x∀y∀z Parent(x, y) ∧ Parent(y, z) → GrandParent(x, z).

   ② ∀x∀y Parent(x, y) → ¬Parent(y, x).

   State a model with Parent(x, y) and GrandParent(y, x).

5. Use nested quantifiers to express the following statements and give explanations.

   A. "there is no largest prime number".

   B. $\lim_{x \to \infty} f(x) = y$

6. Let likes(x, y) denote the predicate that x likes y. Explain the following two predicates and state their difference

   A. $\forall x \exists y$: likes(x, y)

   B. $\exists y \forall x$: likes(x, y)

7. "No cows are blue" can be expressed by $\sim \exists x : Cow(x) \wedge Blue(x)$. Give the other four versions and explain each of their derivations.