EXERCISE 3

Science of Computational Logic

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Problem 3.1

Judge the following propositions and prove them according to your judgement.

1. There is equational theory E such that the two substitutions $\theta = \{X \mapsto a, Y \mapsto b\}$ and $\eta = \{X \mapsto b, Y \mapsto a\}$ are E-equal.
2. There is an equational theory E such that the two substitutions $\theta = \{X \mapsto a, Y \mapsto b\}$ and $\eta = \{X \mapsto b, Y \mapsto a\}$ are *not* E-equal.
3. The following two substitutions $\theta = \{X \mapsto a\}$, $\eta = \{X \mapsto b\}$ E-equal, if $E = \{a \approx b\}$.
4. The following two substitutions $\theta = \{X \mapsto f(f(a,a),a)\}$, $\eta = \{X \mapsto f(a,f(a,a))\}$ E-equal, if E is the associative theory.

Problem 3.2

Prove the following statements:

1. Show that commutativity is not unitary.
2. Show that associativity is infinitary.

Problem 3.3

Describe a E-Unification procedure for commutative theories.