

Automated Reasoning Exercises

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Problem 1: Let $S := \{p(a, b), \neg p(b, a), a \approx b\}$. Find all \mathcal{E} -interpretations of S . Is S \mathcal{E} -unsatisfiable? Why?

Problem 2: Let $S := \{p(x) \vee x \approx b, \neg p(a), p(b)\}$. Find an \mathcal{E} -unsatisfiable set S' of ground instances of clauses in S .

Problem 3: Let $C_1 := p(f(x, g(x))) \vee q(x)$ and $C_2 := a \approx b \vee g(a) \approx a \vee f(a, g(a)) \approx b$. Find all binary paramodulants of C_1 and C_2 .

Problem 4: Consider the following set S of clauses:

- (1) $r(a) \vee r(b)$
- (2) $\neg p(y) \vee s(a, y)$
- (3) $\neg r(x) \vee \neg q(y) \vee \neg s(x, y)$
- (4) $p(a) \vee \neg q(a)$
- (5) $q(b) \vee \neg r(b)$
- (6) $a \approx b$

Using the \mathcal{PR} inference system discussed in the class, find a refutation from S .

Problem 5: Consider the following set S of clauses:

- (1) $p(b) \vee q(a)$
- (2) $p(a) \vee \neg q(b)$
- (3) $\neg p(a) \vee q(b)$
- (4) $\neg p(b) \vee \neg q(a)$
- (5) $a \approx b$

Find a refutation from S , which starts with taking the binary paramodulation of (5) and (1), and uses the clause computed in the previous step as a premise of the next application of a rule from \mathcal{PR} .