

Assignment 4

1. Prove refutation soundness and completeness of ordered hyperresolution with ordered positive factoring. (Hint: try to follow the proof for the system \mathcal{O} .)
2. A Horn clause is a clause with at most one positive literal. Prove the refutation soundness and completeness of the following rule for a set of Horn clauses:

Positive Unit Resolution:

$$\frac{A \quad D \vee \neg B}{D\sigma}$$

where $\sigma = mgu(A, B)$.

3. Unit Resolution is a binary resolution where one of the premises must be a unit clause (i.e. a clause containing one literal). Using Unit Resolution prove that $\exists x_5. \neg S(x_5) \wedge R(x_5)$ follows from the following set of universally quantified clauses:
 $\{\neg S(x_1) \vee \neg P(x_1, b), \neg P(a, x_2) \vee Q(x_2, x_2), \neg Q(x_3, y) \vee R(x_3) \vee S(x_3), P(a, x_4)\}$.