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Tutorials for "Automated Reasoning WS22/23"
Exercise sheet 1

Exercise 1.1:
Convert the following formulas in CNF using both $\Rightarrow_{\text{BCNF}}$ and $\Rightarrow_{\text{ACNF}}$.:

1. $P \wedge \neg(Q \leftrightarrow R)$

2. $[(P \rightarrow S) \wedge \neg Q] \leftrightarrow [R \vee (\neg S \rightarrow Q)]$

3. $[\neg(\neg P \vee (Q \wedge R))] \rightarrow [P \wedge (\neg Q \leftrightarrow \neg R)]$

4. $P \wedge \neg[(Q \leftrightarrow R) \vee (S \rightarrow T)]$

5. $\neg[(P \wedge (P \rightarrow Q)) \leftrightarrow (P \vee Q)]$

Exercise 1.2:
Prove that the following formula is valid via resolution:

$$(P \rightarrow Q) \rightarrow [(R \vee P) \rightarrow (R \vee Q)]$$

apply $\Rightarrow_{ACNF}$ to the negated formula and the resolution calculus to the resulting clauses until you derive the empty clause.

Exercise* 1.3:
Prove that resolution is still complete using the semantic tree method if Subsumption is added.

Exercise 1.4:
Use CDCL to decide satisfiability of the following clause set.

(1)	$\neg P_1 \vee \neg P_2$	(2)	$P_3 \vee P_2 \vee P_4$	(3)	$P_2 \vee \neg P_4$
(4)	$\neg P_3 \vee P_2$	(5)	$P_1 \vee P_2 \vee P_4$		

It is not encouraged to prepare joint solutions, because we do not support joint exams.