Propositional Logic

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Overview

Practice Problem 1 - Which of the following are correct? I

- $False \models True$
- $True \models False$
- $(A \wedge B) \models (A \Leftrightarrow B)$
- $A \Leftrightarrow B \models A \vee B$
- $A \Leftrightarrow B \models \neg A \vee B$
- $(A \wedge B) \Rightarrow C \models (A \Rightarrow C) \vee (B \Rightarrow C)$.

Practice Problem 1 - Which of the following are correct? II

- $(C \vee (\neg A \wedge \neg B)) \equiv ((A \Rightarrow C) \wedge (B \Rightarrow C))$.
- $(A \vee B) \wedge (\neg C \vee \neg D \vee E) \models (A \vee B)$.
- $(A \vee B) \wedge (\neg C \vee \neg D \vee E) \models (A \vee B) \wedge (\neg D \vee E)$.
- $(A \vee B) \wedge \neg(A \Rightarrow B)$ is satisfiable.
- $(A \Leftrightarrow B) \wedge (\neg A \vee B)$ is satisfiable.
- $(A \Leftrightarrow B) \Leftrightarrow C$ has the same number of models as $(A \Leftrightarrow B)$ for any fixed set of proposition symbols that includes A, B, C.

Practice Problem 2

Decide whether each of the following sentences is valid, unsatisfiable, or neither. Verify your decisions using truth tables or the equivalence rules:

- $Smoke \Rightarrow Smoke$
- $Smoke \Rightarrow Fire$
- $(Smoke \Rightarrow Fire) \Rightarrow (\neg Smoke \Rightarrow \neg Fire)$
- $Smoke \vee Fire \vee \neg Fire$
- $((Smoke \wedge Heat) \Rightarrow Fire) \Leftrightarrow ((Smoke \Rightarrow Fire) \vee (Heat \Rightarrow Fire))$
- $(Smoke \Rightarrow Fire) \Rightarrow ((Smoke \wedge Heat) \Rightarrow Fire)$
- $Big \vee Dumb \vee (Big \Rightarrow Dumb)$

Practice Problem 3

Given the following set of sentences:

- $S1 : A \Leftrightarrow (B \vee E)$
- $S2 : E \Rightarrow D$
- $S3 : C \wedge F \Rightarrow \neg B$
- $S4 : E \Rightarrow B$
- $S5 : B \Rightarrow F$
- $S6 : B \Rightarrow C$

use **resolution** to prove the sentence $\neg A \vee \neg B$

Practice Problem 4

Convert the following set of sentences to clausal form:

- $S1 : A \Leftrightarrow (B \vee E)$
- $S2 : E \Rightarrow D$
- $S3 : C \wedge F \Rightarrow \neg B$
- $S4 : E \Rightarrow B$
- $S5 : B \Rightarrow F$
- $S6 : B \Rightarrow C$

Give a trace of the execution of **DPLL** on the conjunction of these clauses.

The End