
CS440

HOMWORK 4 (DUE THURS 9/28)

1. [25 pts] Let α, β be sentences in propositional logic. Prove each of the following assertions:

(a) $\alpha \models \beta$ if and only if the sentence $\alpha \Rightarrow \beta$ is valid (a tautology).

(b) For any α , $False \models \alpha$.

(c) α is valid if and only if $True \models \alpha$.

2. [20 pts]

For each of the following sentences, say whether it is satisfiable, unsatisfiable, or valid. Prove your answer.

(a) $P \Rightarrow P$

(b) $P \Rightarrow \neg P$

(c) $\neg P \Rightarrow P$

(d) $P \Leftrightarrow \neg P$

(e) $P \Rightarrow (Q \Rightarrow P)$

3. [15 pts]

Convert the following propositional calculus sentences into CNF:

(a) $\neg(((P \vee \neg Q) \Rightarrow R) \Rightarrow (P \wedge R))$

(b) $P \Leftrightarrow (Q \wedge R)$

4. [40 pts]

Heads, I win; tails, you lose. Express these statements (plus other statements you might need) in the propositional calculus, and then use resolution to prove that I win.

Submission In writing, in class, on the due date.