Applied Logic - CS4860-2018 - Problem Set 1

1 Problems

Problem 1: Give Smullyan style *tableaux proofs* for each of the following formulas.

1. $((A \Rightarrow B) \Rightarrow A) \Rightarrow A$.
2. $(A \Rightarrow B) \Leftrightarrow (\neg A \ \vee \ B)$.
3. $(A \wedge B) \Leftrightarrow \neg(A \Rightarrow \neg B)$.
4. $(A \ \& \ B) \Leftrightarrow \neg(A \Rightarrow \neg B)$.
5. $\neg A \Rightarrow (A \Rightarrow B)$.
6. $(A \Rightarrow B) \Rightarrow (\neg B \Rightarrow \neg A)$.
7. $(A \Rightarrow B) \Rightarrow ((A \Rightarrow (B \Rightarrow C)) \Rightarrow (A \Rightarrow C))$.

Problem 2: Add the two constants, *True* and *False* to Smullyan's account of the Propositional Calculus. What are the new tableaux style proof rules required for this extended logic? For example, one of the rules should be $False \Rightarrow P$ where P is any propositional formula.

Problem 3: Create a propositional formula that you think is especially interesting and give a tableaux proof for it.