COMP2411 Tutorial 2

1. Using truth tables, complete the problems from lectures 3 and 4:

   (a) Does \( S \rightarrow (A \lor F), (A \land D) \rightarrow S, F \rightarrow S \models (S \land \neg F) \rightarrow A \)?

   (b) Does \( S \rightarrow (A \lor F), (A \land D) \rightarrow S \models F \rightarrow S \)?

   (c) Does \( S \rightarrow (A \lor F), (A \land D) \rightarrow S, F \rightarrow S \models D \rightarrow (S \leftrightarrow (A \lor F)) \)?

   (Observe that you can do all three problems just by adding columns to the one table.)

2. Natural Deduction problems from the textbook: Exercises 1.4: Q1, 2a-f.

Advanced Questions

1. Show that validity of a formula does not depend on the set of propositions we use to construct the truth table. More precisely, let \( \phi \) be a formula and let \( S \) be the set of propositional constants occurring in \( \phi \). Let \( S' \) be any larger set of propositional constants, i.e., let \( S \subseteq S' \). Show that \( \phi \) is true in every line of the truth table in which the rows correspond to all ways of assigning a truth value to the constants \( S \) iff \( \phi \) is true in every line of the truth table in which the rows correspond to all ways of assigning a truth value to the constants \( S' \).

2. Show that validity of formulae is preserved under substitution: Let \( \phi(p) \) be any formula containing the propositional constant \( p \) (possibly more than once) and let \( \alpha \) be any formula. Show that if \( \phi(p) \) is valid then so is \( \phi(\alpha) \).