Homework 2: Propositional Logic


1. Handwritten answers are fine but please make sure they are readable.
2. Your name should be printed at the very top of the document.

Administration. This assignment will be graded by GTA.

Practice Questions – Do NOT submit these.

Textbook questions 2.1, 2.3 (a) and (b), 2.4, 2.5, 2.6, 2.7 (a) and (b), 2.8, 2.11, 2.14, 2.15 2.16 2.5, 2.6, 2.7(b), 2.8, 2.11, 2.14, 2.15, 3.1

Question that will be graded. Total Points 100.

Exercise 1. Part (a) [50 points].
Prove the following equivalence by substitution, i.e., use known logical equivalences to show that
\((p \rightarrow r) \rightarrow ((q \rightarrow r) \rightarrow ((p \lor q) \rightarrow r))\) is equivalent to TRUE. You must start from the statement
\((p \rightarrow r) \rightarrow ((q \rightarrow r) \rightarrow ((p \lor q) \rightarrow r))\). Justify each step with the name of the corresponding logical equivalence being used. For full credit, do not skip steps!

\[(p \rightarrow r) \rightarrow ((q \rightarrow r) \rightarrow ((p \lor q) \rightarrow r)) \equiv \text{TRUE}\]

Part (b) [50 points].
(i) (25 points) Prove that the Method of Affirming (Modus Ponens) is sound using truth tables.
(ii) (25 points) Prove that the Method of Denying (Modus Tollens) is sound using truth tables.