Assignment #4

Pen & paper problems:

1.) Use the grammatical rules (for the construction of formulas) "backwards" to decide, whether an expression of the language of sentential logic is or is not a formula of the language. Decide first, whether the sequences of symbols are indeed expressions, i.e., use only symbols of the language. Consider:

\[ (((P \land Q) \lor R) \rightarrow S) \]
\[ ((P \land (Q \land R)) \rightarrow ((P \land Q) \land R)) \]
\[ ((P \land Q) \lor \neg R) \]

A positive answer should be supported by an appropriate parse-tree; a negative one should be supported by an argument that the expression cannot be constructed according to the grammatical rules.

2.) Consider the formula \((P \land Q) \lor (\neg Q \rightarrow \neg P)\) and the truth-value assignment \(t\) to the atomic formula \(P\) and \(f\) to the atomic formula \(Q\). Use the parse-tree and the characteristic truth tables for the logical connectives to determine the truth-value of the given formula. Draw a grammatical tree and indicate the successive truth-value determinations. (Recall Quine’s dictum: Logic chases truth up the tree of grammar.)

3.) Determine, whether the formula \((P \rightarrow Q) \rightarrow (\neg Q \rightarrow \neg P)\) is a tautology.

4.) Do Exercise 2.3.2.

Proof Lab Problems:

5.) Do two problems each from Exercises 2.3.3, 2.3.4, and 2.3.5.

Please complete the Proof Lab exercises before Wednesday night and hand in the solutions of the pen & paper exercises by noon of Thursday, September 29; please leave them in Tyler Gibson’s mailbox.