

3.9.1. Connective and Expressive Power Problems

1. Show that $\{\leftrightarrow, \oplus\} \equiv \{\sim, \oplus\}$, by building a $\{\leftrightarrow, \oplus\}$ sentence that covers the truth table for “ $\sim P$ ” (that is: has the same truth table as “ $\sim P$ ”).
2. Use $\{\mid\}$ to cover the truth tables for “ $(P \wedge Q)$ ” and for “ $\sim P$ ”.
3. Make an argument that $\{\%$ by itself is expressively inadequate. (*Hint: find a semantic feature that all atomic sentences have, and which a “ $\%$ ” sentence has if its left and right parts have it, but which some truth table doesn’t have. For an example of this sort of argument, see 2.30 §3.*)
4. Show that $\{\rightarrow, \%$ and $\{\rightarrow, \oplus\}$ are expressively adequate (by providing a sentence from each language that covers the truth table for “ $\sim P$ ”).
5. Show that the language $\{\rightarrow, \perp\}$ is expressively adequate.