

Logic, First Course, Winter 2020. Week 1, Section Meeting, Handout.

Definition of well-formed formula

We start with a basic list of basic propositional formulas $a, b, c, \dots, p, q, r, \dots$. They are basic in that they do not have any further structure.

Then we give some rules how to generate more complex well-formed formulas from simpler well-formed formulas, and we say what the *main connective* is of the complex well-formed formula:

- If ϕ is a proposition, then $\neg\phi$ is a well-formed formula and its main connective is the negation symbol \neg .
- If ϕ and ψ are propositions, then $(\phi \wedge \psi)$ is a well-formed formula and its main connective is the conjunction symbol \wedge .
- If ϕ and ψ are propositions, then $(\phi \vee \psi)$ is a well-formed formula and its main connective is the disjunction symbol \vee .
- If ϕ and ψ are propositions, then $(\phi \rightarrow \psi)$ is a well-formed formula and its main connective is the implication symbol \rightarrow .
- If ϕ and ψ are propositions, then $(\phi \leftrightarrow \psi)$ is a well-formed formula and its main connective is the biconditional symbol \leftrightarrow .

Finally, we say that nothing else is a well-formed formula besides what can be generated in the way described above.

Practice finding the main connectives

$((p \wedge q) \rightarrow (\neg q \vee r))$

$(q \rightarrow ((\neg p \vee r) \wedge s))$

$((p \wedge \neg q) \vee (q \leftrightarrow r))$

$((p \rightarrow (q \wedge \neg r)) \rightarrow (s \vee \neg t))$

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