

Homework 2

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Problem 1. Which of the following are sentences of propositional logic (that is, of what is called TFL in forall x)?

1. p
2. $p \rightarrow q$
3. $(p \vee q)$
4. $(p \rightarrow (q \vee (\neg r \leftrightarrow s\neg)))$
5. $\neg\neg p \wedge q$

Problem 2. How many sentences of propositional logic (that is, of what is called TFL in forall x) can be formed from just the sentence letter p and the unary sentence operator \neg ?

Problem 3. Is the argument below valid? Explain your answer by constructing a truth table for the argument.

1. $\neg p$
2. $p \rightarrow q$
3. $\neg q$

Problem 4. Is the argument below valid? Explain your answer by constructing a truth table for the argument.

1. p
2. q
3. $p \wedge q$

Problem 5. Determine whether or not the following natural-language argument is sound by (i) translating it into the formalism of propositional logic (that is, into what is called TFL in forall x), (ii) constructing a truth table for the translated argument to determine whether or not the natural-language argument is valid, and (iii) determining whether or not the premises in the natural-language argument are true.

1. *Either the Yankees won the 1998 world series or the Padres won the 1998 world series.*
2. *The Yankees won the 1998 world series.*
3. *The Padres did not win the 1998 world series.*

Problem 6. *Determine whether or not the following natural-language argument is sound by (i) translating it into the formalism of propositional logic (that is, into what is called TFL in forallx), (ii) constructing a truth table for the translated argument to determine whether or not the natural-language argument is valid, and (iii) determining whether or not the premises in the natural-language argument are true.*

1. *If Emily Dickinson was born in Chicago, then Emily Dickinson was born in Illinois.*
2. *Emily Dickinson was not born in Illinois.*
3. *Emily Dickinson was not born in Chicago.*

Problem 7. *Give the complete truth table for the sentence $((p \rightarrow \neg q) \vee r) \vee (p \wedge \neg r)$.*

Problem 8. *Which of the sentences below are tautologies? Which are contradictions? Which are neither?*

1. $(p \vee \neg p)$
2. $(p \vee p)$
3. $(p \wedge \neg p)$
4. $\neg(p \wedge \neg p)$
5. $\neg(p \rightarrow \neg p)$

Problem 9. *Which pairs of sentences are logically equivalent?*

1. $\neg\neg p, \neg\neg\neg\neg\neg\neg p$
2. $\neg(p \rightarrow \neg p), \neg p$
3. $(p \vee (\neg q \vee r)), ((p \vee \neg q) \vee r)$
4. $(p \leftrightarrow \neg(p \vee q)), (p \leftrightarrow \neg q)$
5. $(p \wedge q), \neg(\neg p \vee \neg q)$

Problem 10. *Do $p \rightarrow q$ and $q \rightarrow r$ jointly entail $p \rightarrow r$? Construct a truth table to demonstrate that your answer is correct. If $p \rightarrow q$ and $q \rightarrow r$ do jointly entail $p \rightarrow r$, use the truth table to explain why. If not, use the truth table to explain why not.*