

Discrete Structures
Fall 2015
Homework#2
Due Tuesday 09/29

Section 1.3 text book

9. Show that each of these conditional statements is a tautology by using truth tables.
- a) $(p \wedge q) \rightarrow p$ b) $p \rightarrow (p \vee q)$
c) $\neg p \rightarrow (p \rightarrow q)$ d) $(p \wedge q) \rightarrow (p \rightarrow q)$
e) $\neg(p \rightarrow q) \rightarrow p$ f) $\neg(p \rightarrow q) \rightarrow \neg q$
14. Determine whether $(\neg p \wedge (p \rightarrow q)) \rightarrow \neg q$ is a tautology.
16. Show that $p \leftrightarrow q$ and $(p \wedge q) \vee (\neg p \wedge \neg q)$ are logically equivalent.
24. Show that $(p \rightarrow q) \vee (p \rightarrow r)$ and $p \rightarrow (q \vee r)$ are logically equivalent.
28. Show that $p \leftrightarrow q$ and $\neg p \leftrightarrow \neg q$ are logically equivalent.

Section 1.4 text book:

12. Let $Q(x)$ be the statement " $x + 1 > 2x$." If the domain consists of all integers, what are these truth values?
- a) $Q(0)$ b) $Q(-1)$ c) $Q(1)$
d) $\exists x Q(x)$ e) $\forall x Q(x)$ f) $\exists x \neg Q(x)$
g) $\forall x \neg Q(x)$
14. Determine the truth value of each of these statements if the domain consists of all real numbers.
- a) $\exists x(x^3 = -1)$ b) $\exists x(x^4 < x^2)$
c) $\forall x((-x)^2 = x^2)$ d) $\forall x(2x > x)$
18. Suppose that the domain of the propositional function $P(x)$ consists of the integers $-2, -1, 0, 1,$ and 2 . Write out each of these propositions using disjunctions, conjunctions, and negations.
- a) $\exists x P(x)$ b) $\forall x P(x)$ c) $\exists x \neg P(x)$
d) $\forall x \neg P(x)$ e) $\neg \exists x P(x)$ f) $\neg \forall x P(x)$
44. Determine whether $\forall x(P(x) \leftrightarrow Q(x))$ and $\forall x P(x) \leftrightarrow \forall x Q(x)$ are logically equivalent. Justify your answer.