

Due: Week 2

Erg Slobodak
4000317144

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Discrete Math: HW #4

Problem Set:

1.1: 10, 14

1.3 2, 4, 10, 12

1.4 2, 12, 16

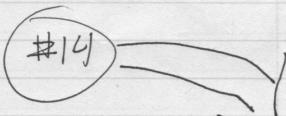
Section 1.1:

10) Given:

p : The election is decided

q : The votes have been counted

- a) The election has ^{not} is not been decided
- b) The election is decided or the votes have been counted
- c) The election is not decided and the votes have been counted
- d) If the election is decided, then the votes have been counted
- e) If the votes have not been counted, then the election is not decided
- f) If the election is not decided, then the votes have not been counted
- g) The election is decided if and only if the votes have been counted
- h) The election is not decided and the votes have been counted, or the votes have not been counted



14) Given:

p = You get an A on the final exam

q = You do every exercise in this book

r = You get an A on this class

- a) $r \wedge \neg q$
- b) $(p \wedge q) \wedge r$
- c) $r \leftrightarrow p$
- d) $(p \wedge \neg q) \wedge r$
- e) $(p \wedge \neg r) \leftrightarrow r$
- f) $r \leftrightarrow (q \vee p)$

Section 1.3

2)

\star P	$\neg P$	$\neg(\neg P)$ \star
T	F	T
F	T	F

$\neg(\neg P) \equiv P$

4)

$p \wedge q \wedge r$	$p \vee q$	$\neg(p \vee q)$	$(p \vee q) \vee r$	$\neg((p \vee q) \vee r)$	$p \vee (q \vee r)$
T T T	T	T	T	T	T
T T F	T	T	T	T	T
T F T	T	T	T	T	T
T F F	T	F	F	T	T
F T T	T	T	T	T	T
F T F	T	T	T	T	T
F F T	F	T	T	T	T
F F F	F	F	F	F	F

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

#10

10)

$p \mid q$	$\neg p$	$p \vee q$	$\neg p \wedge (p \vee q)$	$[\neg p \wedge (p \vee q)] \rightarrow q$
T T	F	T	F	T
T F	F	T	F	T
F T	T	T	T	T
F F	T	F	F	T

b)

$p \mid q \mid r$	$p \rightarrow q$	$q \rightarrow r$	$p \rightarrow r$	$(p \rightarrow q) \wedge (q \rightarrow r)$	$[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$
T T T	T	T	T	T	T
T T F	T	F	F	F	T
T F T	F	T	T	F	T
T F F	F	T	F	F	T
F T T	T	T	T	T	T
F T F	T	F	T	F	T
F F T	T	T	T	T	T
F F F	T	T	T	T	T

c)

$p \mid q$	$p \rightarrow q$	$p \wedge (p \rightarrow q)$	$[(p \wedge (p \rightarrow q)) \rightarrow q]$
T T	T	T	T
T F	F	F	T
F T	T	F	T
F F	T	F	T

d)

$p \mid q \mid r$	$p \vee q$	$r \rightarrow p$	$(p \vee q) \wedge (r \rightarrow p)$	$[r \rightarrow p] \wedge [(p \vee q) \wedge (r \rightarrow p)]$	$[(r \rightarrow p) \wedge ((p \vee q) \wedge (r \rightarrow p))] \rightarrow r$
T T T	T	T	T	T	T
T T F	T	F	F	F	T
T F T	T	T	T	T	T
T F F	T	F	F	T	T
F T T	T	T	T	T	T
F T F	T	T	T	F	F
F F T	F	T	F	T	T
F F F	F	T	F	T	T

12)

- a) $\neg[(\neg p \wedge (p \vee q)) \leftrightarrow b]$
- b) $[(p \rightarrow q) \wedge (q \rightarrow r)] \leftrightarrow (p \rightarrow r)$
- c) $[p \wedge (p \rightarrow q)] \leftrightarrow q$
- d) $[(p \vee q) \wedge (p \rightarrow r) \wedge (q \rightarrow r)] \leftrightarrow r$

Section 1.4:

2)

- a) False
- b) False
- c) False
- d) True

12) $Q(x) = x+1 > 2x$

a) $Q(0) = 0+1 > 2(0)$ True
 $1 > 0$

b) $Q(-1) = -1+1 > 2(-1)$ True

c) $Q(1) = 1+1 > 2(1)$ False
 $2 > 2$

d) $\exists x Q(x) \quad x \leq 0$ Then True

e) $\forall x Q(x) \quad x > 0$ Then False

f) $\exists x \neg Q(x)$

b)
c) $\exists x (x^2 = 2)$

$$x^2 = 2$$

$$x = \pm \sqrt{2}$$

b) $\exists x (x^2 = -1)$

$$x = \pm i$$

c) $\forall x (x^2 + 2 \geq 1)$

x is always True

d) $\forall x (x^2 \neq x)$

x is not true
at 0 and 1