

CSE 015: Discrete Mathematics
Fall 2019
Homework #1
Solution

Andre Martin
Lab CSE-015-07L F 1:30-4:20pm

September 20, 2019

1. Question 1:

- (a) I did not buy a lottery ticket this week.
- (b) If I bought a lottery ticket this week, then I will win the million dollar jackpot on Friday.
- (c) I bought a lottery ticket this week, and I won the million dollar jackpot on Friday.
- (d) I will win the million dollar jackpot on Friday if and only if I buy a lottery ticket this week.
- (e) If I do not buy the lottery ticket this week, then I will not win the million dollar jackpot on Friday.

2. Question 2:

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

3. Question 3:

(a)

p	$\neg p$	$p \rightarrow \neg p$
T	F	F
F	T	T

(b)

p	$\neg p$	$p \Leftrightarrow \neg p$
F	T	F
T	F	F

(c)

p	q	$p \wedge q$	$p \vee q$	$(p \wedge q) \rightarrow (p \vee q)$
T	T	F	T	F
T	F	T	T	F
F	T	F	T	F
F	F	F	T	F

	p	q	$q \rightarrow \neg p$	$p \leftrightarrow q$	$(q \rightarrow \neg p) \Leftrightarrow (p \leftrightarrow q)$
	T	T	F	T	F
(d)	T	F	T	F	F
	F	T	T	F	F
	F	F	T	T	T

4. **Question 4:**

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

Question 5:

	p	q	r	$p \vee q$	$(p \vee q)$	$q \vee r$	$p \vee (q \vee r)$
	T	T	T	T	T	T	T
	T	T	F	T	T	T	T
	T	F	T	T	T	T	T
(a)	T	F	F	T	T	F	T
	F	T	T	T	T	T	T
	F	T	F	T	T	T	T
	F	F	T	F	T	T	T
	F	F	F	F	F	F	F

	p	q	r	$p \wedge q$	$(p \wedge q)$	$q \wedge p$	$p \wedge (q \wedge r)$
	T	T	T	T	T	T	T
	T	T	F	T	F	T	F
	T	F	T	F	F	F	F
(b)	T	F	F	F	F	F	F
	F	T	T	F	F	F	F
	F	T	F	F	F	F	F
	F	F	T	F	F	F	F
	F	F	F	F	F	F	F

Question 6:

	p	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
(a)	T	T	F	T	F	T
	F	T	T	T	T	T
	F	T	T	F	F	T

	p	q	r	$(p \rightarrow q)$	$(q \rightarrow r)$	$(p \rightarrow q) \wedge (q \rightarrow r)$	$(p \rightarrow q) \wedge q \rightarrow r \rightarrow (p \rightarrow r)$
	T	T	T	T	T	T	T
	T	T	F	T	T	F	T
	T	F	T	F	F	F	T
(b)	T	F	F	F	F	F	T
	F	T	T	T	T	T	T
	F	T	F	T	T	F	T
	F	F	T	T	F	T	T
	F	F	F	T	F	T	T

	p	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
(c)	F	T	T	F	T
	F	F	T	F	T