

MACM 101 Chapter 1 Homework

Alexander Ng

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1 Section 1.1

Question 22

- a) Inclusive or, the requirement is experience with one or the other, and having both would still satisfy the requirement.
- b) Exclusive or, Lunch will come with either soup or salad, not both.
- c) Inclusive or, having both documents will not get you turned away.
- d) Exclusive or, publishing prevents perishing.

Question 24

- a) If you get promoted, then you have washed the Boss's car.
- b) If there are winds from the south, then there is a spring thaw.
- c) If you bought the computer less than a year ago, then the warranty is good.
- d) If Willy cheats, then he gets caught.
- e) If you can access the website, then you have paid a subscription fee.
- f) If you know the right people, then you get elected.
- g) If Carol is on a boat, then she gets seasick.

Question 26

- a) If you send me an e-mail message, then I will remember to send you the address.
- b) If you were born in the United States, then you are a citizen of this country.
- c) If you keep your textbook, then it will be a useful reference in your future courses.
- d) If their goalie plays well, then the Red Wings will win the Stanley Cup.
- e) If you get the job, then you had the best credentials.
- f) If there is a storm, then the beach erodes.
- g) If you log on to the server, then you have a valid password.
- h) If you do not begin your climb too late, then you will reach the summit.
- i) If you are among the first 100 customers tomorrow, then you will get a free ice cream cone.

Question 38

- a) $(p \vee q) \vee r$

p	q	r	$p \vee q$	$(p \vee q) \vee r$
0	0	0	0	0
0	0	1	0	1
0	1	0	1	1
0	1	1	1	1
1	0	0	1	1
1	0	1	1	1
1	1	0	1	1
1	1	1	1	1

- b) $(p \vee q) \wedge r$

p	q	r	$p \vee q$	$(p \vee q) \wedge r$
0	0	0	0	0
0	0	1	0	0
0	1	0	1	0
0	1	1	1	1
1	0	0	1	0
1	0	1	1	1
1	1	0	1	0
1	1	1	1	1

c) $(p \wedge q) \vee r$

p	q	r	$p \wedge q$	$(p \wedge q) \vee r$
0	0	0	0	0
0	0	1	0	1
0	1	0	0	0
0	1	1	0	1
1	0	0	0	0
1	0	1	0	1
1	1	0	1	1
1	1	1	1	1

d) $(p \wedge q) \vee r$

p	q	r	$p \wedge q$	$(p \wedge q) \vee r$
0	0	0	0	0
0	0	1	0	1
0	1	0	0	0
0	1	1	0	1
1	0	0	0	0
1	0	1	0	1
1	1	0	1	1
1	1	1	1	1

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

p	q	r	$\neg r$	$p \vee q$	$(p \vee q) \wedge \neg r$
0	0	0	1	0	0
0	0	1	0	0	0
0	1	0	1	1	1
0	1	1	0	1	0
1	0	0	1	1	1
1	0	1	0	1	0
1	1	0	1	1	1
1	1	1	0	1	0

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

p	q	r	$\neg r$	$p \wedge q$	$(p \wedge q) \vee \neg r$
0	0	0	1	0	1
0	0	1	0	0	0
0	1	0	1	0	1
0	1	1	0	0	0
1	0	0	1	0	1
1	0	1	0	0	0
1	1	0	1	1	1
1	1	1	0	1	1

Question 42

Given $(p \vee \neg q) \wedge (q \vee \neg r) \wedge (r \vee \neg p)$, show that the statement is true if and only if p , q and r all have the same truth value.

p , q , r have the same truth value

1. Let $p = q = r$
2. $(p \vee \neg q) \wedge (q \vee \neg r) \wedge (r \vee \neg p)$
3. $(p \vee \neg p) \wedge (p \vee \neg p) \wedge (p \vee \neg p)$
4. $(p \vee \neg p) \equiv \mathbb{T}$
5. Apply the Idempotent Law, $p \wedge p \equiv p$
6. $\mathbb{T} \wedge \mathbb{T} \wedge \mathbb{T} \equiv \mathbb{T}$
7. $\therefore \mathbb{T}$.

p, q, r do not have the same truth value

1. Let $p = q = \neg r$
It follows that $r = \neg p$
2. $(p \vee \neg q) \wedge (q \vee \neg r) \wedge (r \vee \neg p)$
3. $(p \vee \neg p) \wedge (p \vee \neg \neg p) \wedge (\neg p \vee \neg p)$
4. Apply the Double Negation Law
 $(p \vee \neg p) \wedge (p \vee p) \wedge (\neg p \vee \neg p)$
5. Apply the Idempotent Law
 $(p \vee \neg p) \wedge p \wedge \neg p$
6. $p \vee \neg p \equiv \mathbb{T}$
 $(\mathbb{T}) \wedge p \wedge \neg p$
7. $p \wedge \neg p \equiv \mathbb{F}$
 $\mathbb{T} \wedge \mathbb{F} \equiv \mathbb{F}$
8. $\therefore \mathbb{F}$