San Jose State University
Department of Mathematics, College of Science
Fall 2009
MATH 42, Discrete Mathematics
Answers of HW1

Please ask if you do not understand the answers.
Please report if you find any errors or typos.

1.1 # 2

a) No
b) No
c) Yes, F
d) No
e) Yes, F
f) No

1.1 # 7

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

1.1 # 13

a) F
b) T
c) T
d) T

1.1 # 24

a) implication : if it snows tonight, then I will stay at home
converse: if I stay at home, then it will snow tonight
contrapositive: if I do not stay at home then it will not snow tonight
inverse: if it does not snow tonight then I will not stay at home

b) implication : I go to the beach whenever it is a sunny summer day
converse: if I go to the beach, then it is a sunny summer day
contrapositive: if I do not go to the beach then it is not a sunny summer day
inverse: if it is not a sunny summer day then I do not go to the beach

c) implication : When I stay up late, it is necessary that I sleep until noon
converse: if I sleep until noon then I stay up late
contrapositive: if I do not sleep until noon then I do not stay up late
inverse: if I do not stay up late then I do not sleep until noon

1.1 # 28

a)

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

b)

p	$\neg$ p	p $\leftrightarrow \neg$ p
T	F	F
F	T	F

c)

p	q	p $\vee$ q	p $\oplus$ (p $\vee$ q)
T	T	T	F
T	F	T	F
F	T	T	T
F	F	F	F

d)

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

e)

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

f)

p	q	p $\leftrightarrow$ q	$\neg$ q	p $\leftrightarrow \neg$ q	(p $\leftrightarrow$ q)$\oplus$ (p $\leftrightarrow \neg$ q)
T	T	T	F	F	T
T	F	F	T	T	T
F	T	F	F	T	T
F	F	T	T	F	T

1.2 # 8

a) Kwane will not take a job in industry and will not go to graduate school.

b) Yoshiko does not know Java or does not know calculus.

c) James is not young, or he is not strong.

d) Rita will not move to Oregon and will not move to Washington.

1.2 # 13

a) Yes, they are logically equivalent because columns 3 and 4 are same.

p	q	p ∧ q	p ∨ (p ∧ q)
T	T	T	T
T	F	F	T
F	T	F	F
F	F	F	F

b) Yes, they are logically equivalent because columns 3 and 4 are same.

p	q	p ∨ q	p ∧ (p ∨ q)
T	T	T	T
T	F	T	T
F	T	T	F
F	F	F	F

1.2 # 21

Yes, they are logically equivalent because columns 4 and 6 are same.

p	q	p ↔ q	¬ (p ↔ q)	¬ p	[¬ p ↔ q
T	T	T	F	F	F
T	F	F	T	F	T
F	T	F	T	T	T
F	F	T	F	T	F

1.2 # 29

It is a tautology because column 8 is all T.

p	q	r	p → q	q → r	(p → q) ∧ (q → r)	p → r	(p → q) ∧ (q → r) → (p → r)
T	T	T	T	T	T	T	T
T	T	F	T	F	F	F	T
T	F	T	F	T	F	T	T
T	F	F	F	T	F	F	T
F	T	T	T	T	T	T	T
F	T	F	T	F	F	T	T
F	F	T	T	T	T	T	T
F	F	F	T	T	T	T	T

1.2 # 58

All five can be made true if we set p and q to be T and r to be F.

p	q	r	p ∨¬ q	¬ p ∨ q	q ∨ r	q ∨¬ r	¬ q ∨¬ r	# of true disjunctions
T	T	T	T	T	T	T	F	4
T	T	F	T	T	T	T	T	5
T	F	T	T	F	T	F	T	3
T	F	F	T	F	F	T	T	3
F	T	T	F	T	T	T	F	3
F	T	F	F	T	T	T	T	4
F	F	T	T	T	T	F	T	4
F	F	F	T	T	F	T	T	4