이산수학 HW1

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1.1 #28

(a)

Converse:

I will stay at home only if it snows tonight.

Contrapositive:

If I don't stay at hone, it will have not snowed tonight.

Inverse:

If it doesn't snow tonight, I will not stay at home.

(b)

Converse:

I go to the beach only if it is a sunny summer day.

Contrapositive:

If I didn't go to the beach, it wasn't a sunny summer day.

Inverse:

If it is not a sunny summer day, I don't go to the beach.

(c)

Converse:

If I sleep until noon, I stayed up late.

Contrapositive:

If I don't sleep until noon, I didn't stay up late.

Inverse:

When I don't stay up late, I don't sleep until noon.

1.1 #38

p	q	r	s	$p \to q$	$(p \to q) \to r$	$((p \to q) \to r) \to s$
T	T	T	T	T	T	T
T	T	T	F	T	T	F
T	T	F	T	T	F	T
T	T	F	F	T	F	T
T	F	T	T	F	T	T
T	F	T	F	F	T	F
T	F	F	T	F	T	T
T	F	F	F	F	T	F
F	T	T	T	T	T	T
F	T	T	F	T	T	F
F	T	F	T	T	F	T
F	T	F	F	T	F	T
F	F	T	T	T	T	T
F	F	T	F	T	T	F

F	F	F	T	T	F	T
F	F	F	F	T	F	T

1.2 #6

$u \rightarrow ((b_{32} \wedge g_1 \wedge r_1 \wedge h_{16}) \vee (b_{64} \wedge g_2 \wedge r_2 \wedge h_{32}))$

1.2 #40

(a) $\neg(p \wedge q)$

(b) $\neg(p \vee q)$

1.3 #22

$(p \rightarrow q) \wedge (p \rightarrow r) = (\neg p \vee q) \wedge (\neg p \vee r) = \neg p \vee (q \wedge r) = p \rightarrow (q \wedge r)$

(Distributive Law was used)

1.3 #40

$p \wedge q \wedge \neg r$

1.4 #14

(a) T, $x = -1$

(b) T, $x = 0.1$

(c) T

(d) F, $x = -1$

1.4 #42

(a) Let $P(x)$ be "user x has access to electronic mailbox"

Thus: $\forall x\, P(x)$

(b) Let $Q(x)$ be "The system mailbox can be accessed by users in group x", $R(x)$ be "The file system in group x is locked"

Thus: $\forall x\, [R(x) \rightarrow Q(x)]$

(c) Let $F(x)$ be "Firewall is in state x", $P(x)$ be "Proxy server is in state x"

Thus: $P(diagnostic) \rightarrow F(diagnostic)$

(d) Let $T(x, y)$ be "The throughput is between x kbps and y kbps, $R(x)$ be "At least x routers are functioning normally", $P(x)$ be "Proxy server is in mode x"

Thus: $T(100, 500) \wedge \neg P(diagnostic) \rightarrow R(1)$

1.5 #24

(a) There exists x for all $y \in \mathbb{R}$, such that $x + y = y$.

In other words, there is an additive identity for the real numbers.

(b) For all real numbers x, y, if x is greater than or equal to 0 and y is less than 0 then $x - y$ is greater than 0.

(c) There exists real numbers x, y such that x, y is less than or equal to 0 and $x - y$ is greater than 0

(d) For all real numbers x, y, x, y are both not equal to 0 if and only if xy is not equal to 0

1.5 #32

(a) $\forall z \exists y \exists x \neg T(x, y, z)$

(b) $\forall x \forall y \neg P(x, y) \vee \exists x \exists y \neg Q(x, y)$

(c) $\forall x \forall y [(Q(x, y) \wedge \neg Q(y, x)) \vee (Q(y, x) \wedge \neg Q(x, y)]$

(d) $\exists y \forall x \forall z(\neg T(x, y, z) \wedge \neg Q(x, y))$

??? #8

From the problem statement,

$Man(x) \rightarrow \neg Island(x)$

$Island(Manhattan)$

Therefore $\neg Man(Manhattan)$

Modus Tollens.