MATH 51 Homework #1

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Section 1.1

8.

Smartphone A: 256 MB RAM, 32 GB ROM, 8 MP Resolution
Smartphone B: 288 MB RAM, 64 GB ROM, 4 MP Resolution
Smartphone C: 128 MB RAM, 32 GB ROM, 5 MP Resolution

(a) True, Smartphone B has the most RAM.

(b) True, Smartphone C has a higher resolution.

(c) False, Smartphone B does not have a higher resolution than A.

(d) False, Smartphone B does not have a higher resolution than C.

(e) False, Smartphone A does not have more RAM than Smartphone B.

10.

(a) I did not buy a lottery ticket.

(b) I bought a ticket or I won the lottery.

(c) If I bought a ticket, then I won the jackpot.

(d) I bought a ticket and won the jackpot.

(e) I bought a ticket if and only if I won the jackpot.

(f) If I did not buy a ticket, then I did not win the jackpot.

(g) I did not buy a ticket and I did not win the jackpot.

(h) Either I didn't buy a ticket, or I bought a ticket and won the jackpot.

20.

(a) True. If false, then false. $F \to F$

(b) True. If false, then false. Same statement as (a).

(c) False. If true, then false. $T \to F$.

(d) True. If true, then true. $T \to T$

24.

(a) If you want to get promoted, then you have to wash the boss' 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 have access to the website, then you pay the subscription fee.

(f) If you got elected, then you know the right people.

(g) If Carol is on a boat, then she will be seasick.

34.

(a)

p	$\neg p$	$p \to \neg p$
F	T	T
T	F	F

(b)

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

(c)

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

(d)

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

(e)

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

(f)

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

40.

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

Section 1.3

4.

(a)

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

(b)

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

8.

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

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

(c) James is not young or not strong.

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

10b.

$$(p \vee q) \rightarrow \neg p \qquad (Statement) \qquad (1)$$

$$\neg(p \vee q) \vee \neg p \qquad (Identity) \qquad (2)$$

$$(\neg p \wedge \neg q) \vee \neg p \qquad (DeMorgan's\ Theorem) \qquad (3)$$

12.

(a)

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

(b)

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

(c)

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

(d)

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

20.

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

With the same inputs, the end results of these are the same. Therefore these two statements are logically equivalent.