

1.1

6.

- b) True
- c) False
- e) False

12.

- c) If you miss the final examination then you do not pass the course.
- d) You have the flu or you miss the final examination or you pass the course.
- e) If you have the flu then you do not pass the course or if you miss the final examination then you do not pass the course.

22.

- a) If you have been promoted, then you have washed the boss' car.
- e) If you have access to the website, then you have paid the subscription fee.
- g) If Carol is on a boat, then she is seasick.

32.

a)

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

1.3

8.

- a) Kwame will not take a job in industry and not go to graduate school.
b) Yoshiko does not know Java or Calculus.

10. b)

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

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

c)

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

12.

c)

$$[p \wedge (p \rightarrow q)] \rightarrow q \equiv$$

$$[p \wedge (\neg p \vee q)] \rightarrow q \equiv$$

$$\neg [p \wedge (\neg p \vee q)] \vee q \equiv$$

$$[\neg p \vee \neg(\neg p \vee q)] \vee q \equiv$$

$$[\neg p \vee (\neg \neg p \wedge \neg q)] \vee q \equiv$$

$$[\neg p \vee (p \wedge \neg q)] \vee q \equiv$$

$[\neg p \vee q \vee (p \wedge \neg q)] \equiv$
 $[\neg p \vee (q \vee p) \wedge (q \vee \neg q)] \equiv$
 $[\neg p \vee (q \vee p) \wedge T] \equiv$
 $[\neg p \vee (q \vee p)] \equiv$
 $[\neg p \vee q \vee p] \equiv$
 $[\neg p \vee p \vee q] \equiv$
 $[T \vee q] \equiv T$

24.

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

32.

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

40. $(p \wedge q) \wedge \neg r$