11.3

1. Given p: 0, q = 1,

$(p \vee \sim q) \wedge q = ?$

$\sim q = 0$

$p \vee \sim q = 0$

$(p \vee \sim q) \wedge q = 0$ #

11.4

1. $p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$

P	q	r	q∨r	p∧q	p∧r	(p∧q)∨(p∧r)	p∧(q∨r)
1	1	1	1	1	1	1	1
1	1	0	1	1	0	1	1
1	0	1	1	0	1	1	1
1	0	0	0	0	0	0	0
0	1	1	1	0	0	0	0
0	1	0	1	0	0	0	0
0	0	1	1	0	0	0	0
0	0	0	0	0	0	0	0

相等 (得证) #

2. $p \rightarrow q \equiv \sim q \rightarrow \sim p$

P	q	~p	~q	p→q	~q→~p
1	1	0	0	1	1
1	0	0	1	0	0
0	1	1	0	1	1
0	0	1	1	1	1

相等 (得证) #

3. $p \vee q \equiv \sim(\sim p \wedge \sim q)$

P	q	~p	~q	p∨q	~p∧~q	~(~p∧~q)
1	1	0	0	1	0	1
1	0	0	1	1	0	1
0	1	1	0	1	0	1
0	0	1	1	0	1	0

相等 (得证) #

4. $p \uparrow q \equiv \sim(p \wedge q)$, $p \downarrow q \equiv \sim(p \vee q)$

(i)

P	q	p∧q	~(p∧q)
1	1	1	0
1	0	0	1
0	1	0	1
0	0	0	1

p↑q

P	q	p∨q	~(p∨q)
1	1	1	0
1	0	1	0
0	1	1	0
0	0	0	1

p↓q

(ii)

p	q	r	q↑r	p↓q	p↓r	(p↓q)↑(p↓r)	p↓(q↑r)	(p↓q)↑(p↓r)→p↓(q↑r)
1	1	1	0	0	0	0	0	1
1	1	0	1	0	0	0	0	1
1	0	1	1	0	0	0	0	1
1	0	0	1	0	0	0	0	1
0	1	1	0	0	0	0	0	1
0	1	0	1	0	1	0	0	1
0	0	1	1	1	0	0	0	1
0	0	0	1	1	1	1	1	1

$$\therefore \ p↓(q↑r) → p↓(q↑r) \equiv t \ \#$$

5. $(p→r)∨(q→r) \equiv ((p∧q)→r)$

p	q	r	p→r	q→r	p∧q	(p→r)∨(q→r)	(p∧q)→r
1	1	1	1	1	1	1	1
1	1	0	0	0	1	0	0
1	0	1	1	1	0	1	1
1	0	0	0	1	0	1	1
0	1	1	1	1	0	1	1
0	1	0	1	0	0	1	1
0	0	1	1	1	0	1	1
0	0	0	1	1	0	1	1

相等   (得证) #

6. $(p→r)∧(q→r) \equiv (p∨q)→r$

p	q	r	p→r	q→r	p∨q	(p→r)∧(q→r)	(p∨q)→r
1	1	1	1	1	1	1	1
1	1	0	0	0	1	0	0
1	0	1	1	1	1	1	1
1	0	0	0	1	1	0	0
0	1	1	1	1	1	1	1
0	1	0	1	0	1	0	0
0	0	1	1	1	0	1	1
0	0	0	1	1	0	1	1

相等   (得证) #

7. (i) $p \uparrow q = \sim(p \wedge q)$

P	q	p∧q	∼(p∧q)	p↑q
1	1	1	0	0
1	0	0	1	1
0	1	0	1	1
0	0	0	1	1

(ii)

P	q	r	p↑q	p∧q	(p↑q)↑r	r→(p∧q)
1	1	1	0	1	1	1
1	1	0	0	1	1	1
1	0	1	1	0	0	0
1	0	0	1	0	1	1
0	1	1	1	0	0	0
0	1	0	1	0	1	1
0	0	1	1	0	0	0
0	0	0	1	0	1	1

相等

$\therefore (p \uparrow q) \uparrow r \equiv r \to (p \wedge q)$

8. $p \to (q \to r) \equiv \sim(p \wedge q) \vee r$

P	q	r	q→r	p∧q	∼(p∧q)	p→(q→r)	∼(p∧q)∨r
1	1	1	1	1	0	1	1
1	1	0	0	1	0	0	0
1	0	1	1	0	1	1	1
1	0	0	1	0	1	1	1
0	1	1	1	0	1	1	1
0	1	0	0	0	1	1	1
0	0	1	1	0	1	1	1
0	0	0	1	0	1	1	1

相等

(得证)

9. $(\sim p \vee q) \wedge p$

P	q	∼p	∼p∨q	(∼p∨q)∧p
1	1	0	1	1
1	0	0	0	0
0	1	1	1	0
0	0	1	1	0

11.5

1.

P	q	r	~r	p∨q	~(p∨q)	~(p∨q)→~r
1	1	1	0	1	0	1
1	1	0	1	1	0	1
1	0	1	0	1	0	1
1	0	0	1	1	0	1
0	1	1	0	1	0	1
0	1	0	1	1	0	1
0	0	1	0	0	1	0	←
0	0	0	1	0	1	1

$\therefore p=0, q=0, r=1$

$\sim p=1, q=0, \sim r=0$ #

11.6 (作答题)

1. $\sim p \rightarrow \sim q, q \therefore p$

P	q	~p	~q	~p→~q	q	P
1	1	0	0	1	1	1
1	0	0	1	1	0	1
0	1	1	0	0	1	0
0	0	1	1	1	0	0

当 $\sim p \rightarrow \sim q$ 及 q 为 1 时, p 为 1

$\therefore$ 此推理有效 #

2. 设 p 为 " $x=3$ "

   q 为 " $y=5$ "

" 若 $x=3, y=5$ " $\Rightarrow p \rightarrow q$

$\therefore$ 当 $y=3, q=0$ $p \rightarrow q \equiv \sim q \rightarrow \sim p$

$\therefore$ 若 $p=1, q=0, p \rightarrow q=0$ $\therefore$ 若 $y \neq 5$, 则 $x \neq 3$ #

$\therefore p=0$

$\therefore x \neq 3$ #

11.6

1. p→q, p→~q ; ∴ ~q

P	q	~q	p→q	p→~q	~a
1	1	0	1	0	0
1	0	1	0	1	1
0	1	0	1	1	0	←
0	0	1	1	1	1

∴ 推理无效 #

~p→q, p ; ∴ ~q

P	q	~P	~p→q	P	~q
1	1	0	1	1	0	←
1	0	0	1	1	1
0	1	1	1	0	0
0	0	1	0	0	1

∴ 推理无效 #

p→q, q ; ∴ p

P	q	p→q	q	P
1	1	1	1	1
1	0	0	0	1
0	1	1	1	0	←
0	0	1	0	0

∴ 推理无效 #

p→q, ~p ; ∴ ~q

P	q	p→q	~p	~q
1	1	1	0	0
1	0	0	0	1
0	1	1	1	0	←
0	0	1	1	1

∴ 推理无效 #

$p \to q, \sim q \therefore \sim p$

p	q	$p \to q$	$\sim q$	$\sim p$
1	1	1	0	0
1	0	0	1	0
0	1	1	0	1
0	0	1	1	1

$\therefore$ 推理有效 #

3.

p	q	r	$\sim q$	$\sim r$	$p \to \sim q$	$r \to p$	$(p \to \sim q) \land (r \to p) \land q$	$(p \to \sim q) \land (r \to p) \land q \to \sim r$
1	1	1	0	0	0	1	0	1
1	1	0	0	1	0	1	0	1
1	0	1	1	0	1	1	0	1
1	0	0	1	1	1	1	0	1
0	1	1	0	0	1	0	0	1
0	1	0	0	1	1	1	1	1
0	0	1	1	0	1	0	0	1
0	0	0	1	1	1	1	0	1

当 $p = q = r = 1$ 时, $(p \to \sim q) \land (r \to p) \land q \to \sim r = 1$

$\therefore$ 推理有效 #

4. $p \to q, p \therefore q$

p	q	$p \to q$	p	q
1	1	1	1	1
1	0	0	1	0
0	1	1	0	1
0	0	1	0	0

$\therefore$ 此推理有效 #