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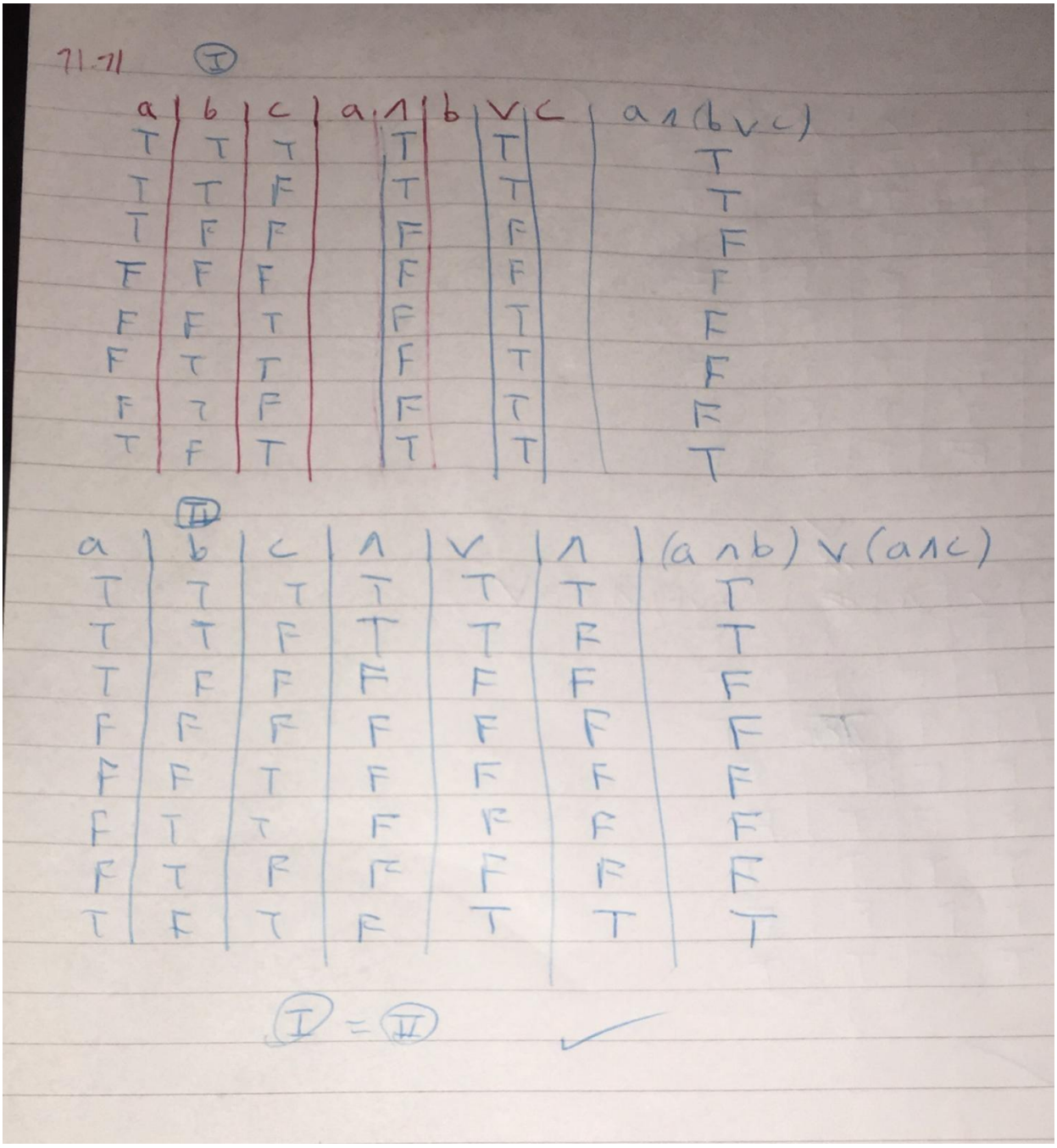

7.1.11 (I)

a	b	c	a ∧	b	∨	c	a ∧ (b ∨ c)
T	T	T	T	T	T		T
T	T	F	T	T	T		T
T	F	F	F	F	F		F
F	F	F	F	F	F		F
F	F	T	F	T	T		F
F	T	T	F	T	T		F
F	T	F	F	T	T		F
T	F	T	T	T	T		T

(II)

a	b	c	∧	∨	∧	(a ∧ b) ∨ (a ∧ c)
T	T	T	T	T	T	T
T	T	F	T	T	F	T
T	F	F	F	F	F	F
F	F	F	F	F	F	F
F	F	T	F	F	F	F
F	T	T	F	F	F	F
F	T	F	F	F	F	F
T	F	T	F	T	T	T

(I) = (II) ✓

1.2 ①

a	b	c	∨	∧	a ∨ (b ∧ c)
T	T	T	T	T	T
T	T	F	T	F	T
T	F	F	T	F	T
F	F	F	F	F	F
F	F	T	F	F	F
F	T	T	T	T	T
T	F	T	T	F	T
F	T	F	T	F	F

②

a	b	c	∨	∧	∨	(a ∨ b) ∧ (a ∨ c)
T	T	T	T	T	T	T
T	T	F	T	T	T	T
T	F	F	T	T	T	T
F	F	F	F	F	F	F
F	F	T	F	F	T	F
F	T	T	T	T	T	T
F	T	F	T	F	F	F
T	F	T	T	T	T	T

①-② ✓

1.3

a	a ∨ a
T	T
F	F

✓

1.4

a	a ∧ a
T	T
F	F

✓

Equivalentias

1) $(a \vee b) \wedge c \equiv \neg(\neg(\neg a \wedge \neg c) \supset \neg c)$

$\equiv \neg(\neg\neg(a \vee b) \supset \neg c)$ (2)

$\equiv \neg((a \vee b) \supset \neg c)$ (3)

$\equiv \neg(\neg(a \vee b) \vee \neg c)$ (4)

$\equiv \neg\neg(a \vee b) \wedge c$ (1)

$\equiv (a \vee b) \wedge c$ ✓

2) $a \vee b \vee a \supset c$

$\equiv \neg(\neg b \wedge \neg a) \supset c$

$\equiv \neg\neg(b \vee a) \supset c$ (2)

$\equiv b \vee a \supset c$ (3)

1.5)

(I)

a	b	c	∨	∧	(a∨b)∧c
T	T	T	T	T	T
T	T	F	T	F	F
T	F	F	T	F	F
F	F	F	F	F	F
F	F	T	F	F	F
F	T	T	T	T	T
T	F	T	T	T	T
F	T	F	T	F	F

(II)

a	b	c	¬	¬	∧	⊃	¬(¬(¬a∧¬b)⊃¬c)
T	T	T	T	F	F	F	T
T	T	F	F	F	F	T	F
T	F	F	F	T	F	T	F
F	F	F	F	F	T	T	F
F	F	T	F	F	T	T	F
F	T	T	T	T	F	F	T
F	T	F	F	T	F	T	F
T	F	T	T	T	F	F	T

(I) ≡ (II)

2.31 $a \vee (b \wedge a) \supset (c \wedge d) \equiv (c \supset d) \supset (\neg a \wedge \neg b) \vee \neg a$

$\Rightarrow 4$

$(\neg c \vee \neg d) \supset (\neg a \wedge \neg b) \vee \neg a$

$\downarrow 4$

$\neg(\neg c \vee \neg d) \vee (\neg a \wedge \neg b) \vee \neg a$

$\downarrow 5$

$(\neg a \wedge \neg b) \vee \neg a \vee \neg(\neg c \vee \neg d)$

$\downarrow 2$

$(\neg a \wedge \neg b) \vee \neg a \vee \neg\neg c \wedge \neg\neg d$

$\downarrow 3$

$(\neg a \wedge \neg b) \vee \neg a \vee c \wedge d$

$\downarrow 3$

$\neg(\neg((\neg a \wedge \neg b) \vee \neg a)) \vee c \wedge d$

$\downarrow 2$

$\neg(\neg(\neg a \wedge \neg b) \wedge \neg\neg a) \vee c \wedge d$

$\downarrow 3$

$\neg(\neg(\neg a \wedge \neg b) \wedge a) \vee c \wedge d$

$\downarrow 1$

$\neg(\neg\neg a \vee \neg\neg b \wedge a) \vee c \wedge d$

$\downarrow 3$

$\neg(a \vee b \wedge a) \vee c \wedge d$

$\downarrow 4$

$(a \vee b \wedge a) \supset (c \wedge d)$

$\downarrow 6$

$a \vee (a \wedge b) \supset c \wedge d$