

Cap 9

1- a) $\neg p \wedge (\neg q \rightarrow p) \rightarrow q$

b) $(p \rightarrow q) \rightarrow \neg(p \wedge \neg q)$

c) $(p \rightarrow q) \wedge (\neg q \vee (n \wedge s)) \rightarrow n \wedge s$

d) $(x=y \rightarrow x=5) \wedge (x=5 \rightarrow x < z) \rightarrow x=y \rightarrow x < z$

2- a) $p, (q \vee \neg p) \vdash q$

b) $(p \rightarrow q), (p \wedge \neg q) \vdash s$

c) $\neg(x < 0 \wedge y \neq x) \vdash x \geq 0 \vee y = x$

3- a) Adição

b) Simplificação

c) Silogismo hipotético

d) Modus Ponens

e) Modus Tolens

f) Conjuncção

g) Silogismo Disjuntivo

h) Absorção

i) Modus Ponens

j) Modus Tolens

k) Conjuncção

l) Adição

m) Silogismo Disjuntivo

n) Silogismo hipotético

o) Simplificação

4- a) $x = z$

d) $z \geq 1$

b) $x \geq 0$

e) $y + 1 = 2$

c) $x \geq z$

f) $x = y$

5- a) $x = 0$

c) $\neg(p \leftrightarrow q)$

b) $x \neq z$

d) $x \leq 3$

6- a) $x \neq 4$

c) $(n \wedge t)$

b) $y < b$

d) $\neg p$

7- a) $p \rightarrow t$

c) $x \vee t \rightarrow \neg s \rightarrow t$

b) $x = 3 \rightarrow x \neq z$

d) $x \vee y = 6 \rightarrow y = 2$

8- a) $n \vee \neg s$

c) $xy = 0 \vee xy > 3$

b) $x \geq 3 \vee x < 2$

d) $x^2 = 4 \vee y^2 = 9$

9- a) $\neg(p \wedge q) \vee \neg q$

c) $x \geq 3 \vee x \leq 4$

b) $\neg p \vee q$

d) $x \neq 2 \vee x \neq 8$

Cap 10

1- $(p \rightarrow q) \wedge (r \rightarrow \sim q) \rightarrow (r \rightarrow \sim p)$ tautologia

a)

V	V	V	F	V	F	F	V	V	V	F	F	V
V	V	V	V	F	V	F	V	V	F	V	F	V
V	F	F	F	V	V	V	F	V	V	F	F	V
V	F	F	V	F	V	V	F	V	F	V	F	V
F	V	V	F	V	F	F	V	V	V	V	V	F
F	V	V	V	F	V	F	V	V	F	V	V	F
F	V	F	V	V	V	V	F	V	V	V	V	F
F	V	F	V	F	V	V	F	V	F	V	V	F

b) $(p \rightarrow \sim q) \wedge (r \rightarrow p) \wedge q \rightarrow \sim r$ tautologia

V	F	F	V	F	V	V	V	F	V	V	F	V
V	F	F	V	F	F	V	V	F	V	V	V	F
V	V	V	F	V	V	V	V	F	F	V	F	V
V	V	V	F	V	F	V	V	F	F	V	V	F
F	V	F	V	F	V	F	F	F	V	V	F	V
F	V	F	V	V	F	V	F	V	V	V	V	F
F	V	V	F	F	V	F	F	F	F	V	V	F
F	V	V	F	V	F	V	F	F	F	V	V	F

c) $(p \rightarrow q) \wedge (r \vee \sim q) \wedge \sim r \rightarrow \sim p$ tautologia

V	V	V	V	V	V	F	V	F	F	V	V	F	V
V	V	V	F	F	F	F	V	F	V	F	V	F	V
V	F	F	F	V	V	V	F	F	F	V	V	F	V
V	F	F	F	F	V	V	F	F	V	F	V	F	V
F	V	V	V	V	V	F	V	F	F	V	V	V	F
F	V	V	F	F	F	F	V	F	V	F	V	V	F
F	V	F	V	V	V	V	F	F	F	V	V	V	F
F	V	F	V	F	V	V	F	F	V	F	V	V	F

$$d) (p \rightarrow q \vee r) \wedge \sim q \rightarrow p \rightarrow r \text{ tautologia}$$

✓ ✓ ✓ V V F F V V V V V V
V V V V F F F V V V F F
V V F V V V V F V V V V
V F F F F F V F V V F F
F V V V V F F V V F V V
F V V V F F F V V F V F
F V F V V V V F V F V V
F V F F V V F V F V F

e) $(p \rightarrow \sim q) \wedge p \wedge (\sim q \rightarrow r) \rightarrow r$ tautologia

✓ F F V F V F F V V V V V
 ✓ F F V F V F F V V F V F
 V V V F V V ✓ V F V V V V
 V V V F V V F V F F V F
 F V F V F F F F V V V V
 F V F V F F F F V V F V F
 F V V F F F F V F V V ✓ V
 F V V F F F F V F F ✓ F

f) $(p \wedge \neg q) \wedge (\neg n \rightarrow q) \rightarrow (p \wedge n)$ tautologie

✓ F F V F F V V V V V V V
 V F F V F V F V V V V F F
 V V V F V F V V F V V V V
 V V V F F V F F F V V F F
 F F F V F F V V V V F F V
 F F F V F V F V V V F F F
 F F V F F F V V F V F F V
 F F V F F V F F F V F F F

g) $(p \vee (q \vee r)) \wedge \sim p \wedge \sim r \rightarrow q$ tautologie

V	V	V	V	F	F	V	F	F	V	V
V	V	V	V	F	F	V	F	V	F	V
V	V	F	V	V	F	F	V	F	F	V
V	V	F	F	F	F	F	V	F	V	F
F	V	V	V	V	V	F	F	F	V	V
F	V	V	V	F	V	V	F	V	V	V
F	V	F	V	V	V	V	F	F	V	V
F	F	F	F	F	F	V	F	F	V	F

h) $(p \vee \sim q) \wedge \sim p \wedge (\sim p \wedge r) \rightarrow q \rightarrow r$ tautologie

V	V	F	V	F	F	V	F	F	V	V	V	V
V	V	F	V	F	F	V	F	V	V	F	V	F
V	V	V	F	F	F	V	F	V	V	V	F	V
V	V	V	F	F	F	V	F	V	F	F	F	V
F	F	F	V	F	V	F	F	V	V	V	V	V
F	F	F	V	F	V	F	F	V	F	F	V	V
F	V	V	F	V	V	F	F	V	F	F	V	V
F	V	V	F	V	V	F	F	V	F	F	F	V

2a) $(p \rightarrow \sim q) \wedge q \wedge (\sim p \rightarrow r \wedge s) \rightarrow r \wedge s$ tautologie

V	F	F	V	F	V	F	V	V	V	V	V	V
V	F	F	V	F	V	F	V	V	F	F	V	V
V	F	F	V	F	V	F	V	V	F	F	V	V
V	F	F	V	F	V	F	V	V	V	F	V	V
V	V	V	F	F	F	F	V	V	F	V	V	V
V	V	V	F	F	F	F	V	V	F	V	V	V
V	V	V	F	F	F	F	V	V	F	V	V	V
F	V	V	F	V	V	F	V	V	V	F	V	V
F	V	V	F	V	V	F	V	V	V	F	V	V
F	V	V	F	V	V	F	V	V	V	F	V	V
F	V	V	F	V	V	F	V	V	V	F	V	V
F	V	V	F	V	V	F	V	V	V	F	V	V
F	V	V	F	V	V	F	V	V	V	F	V	V
F	V	V	F	V	V	F	V	V	V	F	V	V
F	V	V	F	V	V	F	V	V	V	F	V	V

[illegible]

$e(p \vee q) \wedge (q \rightarrow r) \wedge (\sim r \vee s) \rightarrow s$

p	q	r	s	$e(p \vee q)$	$q \rightarrow r$	$\sim r \vee s$	s
T	T	T	T	T	T	F	T
T	T	T	F	T	T	T	F
T	T	F	T	T	F	T	T
T	T	F	F	T	F	F	F
T	F	T	T	F	T	F	T
T	F	T	F	F	T	T	F
T	F	F	T	F	T	T	T
T	F	F	F	F	T	F	F
F	T	T	T	T	T	F	T
F	T	T	F	T	T	T	F
F	T	F	T	T	F	T	T
F	T	F	F	T	F	F	F
F	F	T	T	F	T	F	T
F	F	T	F	F	T	T	F
F	F	F	T	F	T	T	T
F	F	F	F	F	T	F	F

3. $\neg(p \rightarrow \neg q) \wedge (n \rightarrow q) \wedge n \rightarrow \neg p$ tautologia

$\neg(p \rightarrow \neg q)$	$(n \rightarrow q)$	n	$\neg p$
V	F	V	V
V	F	V	F
V	F	F	V
V	F	F	F
V	V	V	V
V	V	V	F
V	V	F	V
V	V	F	F
F	V	V	V
F	V	V	F
F	V	F	V
F	V	F	F
F	F	V	V
F	F	V	F
F	F	F	V
F	F	F	F

$$b) (p \rightarrow q) \wedge \sim (n \wedge \sim p) \wedge (\sim n \rightarrow q) \rightarrow q \quad \text{tautology}$$

Handwritten practice on lined paper showing the letters 'U' and 'V' written repeatedly in a cursive style. The letters are arranged in vertical columns, alternating between 'U' and 'V'.

$$c) (\sim p \rightarrow \sim q) \wedge (\sim q \rightarrow \sim r) \wedge r \rightarrow p \text{ tautologia}$$

Handwritten practice of the letter 'F' on lined paper. The letter is written in a cursive style, with some variations in slant and height. The practice is organized into several columns, each containing multiple rows of the letter. Some letters are written in red ink, while others are in black ink. The columns are separated by vertical lines, and the rows are separated by horizontal lines.

$$d) (p \leftrightarrow q) \wedge (r \leftrightarrow q) \wedge \sim p \rightarrow \sim r \quad \text{tautologia}$$

Handwritten practice of the letter 'F' on lined paper. The letter is written in a cursive style, appearing as a series of connected 'F's across the lines.

5 - p → 20

р. 15

9

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$$V \rightarrow F, V \vee F, V \vdash F$$

V V V P

Não é válido

4-a) $F \rightarrow F, F \rightarrow V, F \vee V \vdash F \vee F$

$$d) \sim(F \wedge V), \sim F \wedge \sim V \rightarrow F \wedge F, F \rightarrow F \vdash F$$

c) $F \leftrightarrow F \vee F, F \leftrightarrow F \vee F, F \leftrightarrow F \vee F \sim F \vdash F \vee F$
 $\quad \quad \quad \checkmark \quad \quad \quad \checkmark \quad \quad \quad \checkmark \quad \quad \quad \checkmark \quad \quad \quad \checkmark$

$$d, \underset{\vee}{V} \rightarrow \underset{\vee}{V} \underset{\vee}{V}, \underset{\vee}{V} \leftrightarrow \underset{\vee}{V}, \underset{\vee}{\neg V} \underset{\vee}{V} \vdash \underset{F}{\sim V} \underset{F}{V}$$
$$2, (V \rightarrow F) \rightarrow F, F \rightarrow \sim V, (V \rightarrow \sim V) \rightarrow V, V \vdash V \rightarrow F$$
$$\frac{F, F \rightarrow (F \rightarrow V)}{V}, \frac{F \rightarrow (F \rightarrow V)}{V}, \frac{\neg(F \wedge V)}{V} \vdash F \rightarrow V$$