

Lista de exercícios - parte 2

- ① $G = \{$ $H(\text{marcos}),$
 $P(\text{marcos}),$
 $\neg P(x_1) \vee R(x_1),$
 $S(\text{cesar}),$
 $\neg R(x_2) \vee L(x_2, \text{cesar}) \vee O(x_2, \text{cesar}),$
 $L(x_3, f(x_3)),$
 $\neg H(x_4) \vee \neg S(y_1) \vee \neg tA(x_4, y_1) \vee \neg L(x_4, y_1),$
 $tA(\text{marcos}, \text{cesar}),$
 $\neg O(\text{marcos}, \text{cesar}) \}$

(m) marcos = m
 (c) cesar = c

\rightarrow o que é "f"? Não serve pra muito ã

$$\neg H(x_4) \vee \neg S(y_1) \vee \neg tA(x_4, y_1) \vee \neg L(x_4, y_1)$$

$H(m)$

$$\theta = \{x_4/m; y_1/c\}$$

$$\neg S(c) \vee \neg tA(m, c) \vee \neg L(m, c)$$

$S(c)$

$$\neg tA(m, c) \vee \neg L(m, c)$$

$tA(m, c)$

$$\neg L(m, c)$$

$$\neg R(x_2) \vee L(x_2, c) \vee O(x_2, c)$$

$$\theta = \{x_2/m\}$$

$$\neg R(m) \vee O(m, c)$$

$$\neg P(x_1) \vee R(x_1)$$

$$\theta = \{x_1/m\}$$

$$\neg P(m) \vee O(m, c)$$

$P(m)$

$$O(m, c)$$

$$\neg O(m, c)$$



$$\begin{aligned}
 & \textcircled{2} \textcircled{a} \quad P \wedge (\neg Q \vee R) \rightarrow ((P \wedge \neg Q) \vee (P \wedge R)) \\
 & \neg (P \wedge (\neg Q \vee R) \rightarrow ((P \wedge \neg Q) \vee (P \wedge R))) \\
 & \neg (\neg (P \wedge (\neg Q \vee R)) \vee ((P \wedge \neg Q) \vee (P \wedge R))) \\
 & (P \wedge (\neg Q \vee R)) \wedge \neg ((P \wedge \neg Q) \vee (P \wedge R)) \\
 & (P \wedge (\neg Q \vee R)) \wedge (\neg (P \wedge \neg Q) \wedge \neg (P \wedge R)) \\
 & P \wedge (\neg Q \vee R) \wedge \neg (P \wedge \neg Q) \wedge \neg (P \wedge R)
 \end{aligned}$$

$$(1) P$$

$$(2) \neg Q \vee R$$

$$(3) \neg P \vee Q$$

$$(4) \neg P \vee \neg R$$

$$\neg P \vee Q$$

$$\neg P \vee \neg R$$

$$\neg P \vee (Q \vee \neg R)$$

$$P$$

$$Q \vee \neg R$$

$$\neg Q \vee R$$

□

$$(b) \exists x \forall y P(x, y) \rightarrow \forall y \exists x P(x, y)$$

$$\neg (\exists x \forall y P(x, y) \rightarrow \forall y \exists x P(x, y))$$

$$\neg (\neg (\exists x \forall y P(x, y)) \vee \forall y \exists x P(x, y))$$

$$\exists x \forall y P(x, y) \wedge \neg (\forall y \exists x P(x, y))$$

$$\exists x \forall y P(x, y) \wedge \exists y \forall x \neg P(x, y)$$

$$\exists x_1 \forall y_1 P(x_1, y_1) \wedge \exists y_2 \forall x_2 \neg P(x_2, y_2)$$

$$\exists x_1 \exists y_2 \forall y_1 \forall x_2 P(x_1, y_1) \wedge \neg P(x_2, y_2)$$

$$G = \{ P(x_1, y_1),$$

$$\neg P(x_2, y_2) \}$$

$$\text{Resolução: } \theta = \{ x_1/a, x_2/a, y_1/b, y_2/b \}$$

$$P(a, b) \quad \neg P(a, b)$$

□

$$c) \neg(\exists x (P(x) \wedge Q(x)) \rightarrow \exists x P(x) \wedge \exists x Q(x))$$

$$\neg(\neg(\exists x (P(x) \wedge Q(x))) \vee \exists x P(x) \wedge \exists x Q(x))$$

$$\exists x (P(x) \wedge Q(x)) \wedge \neg(\exists x P(x) \wedge \exists x Q(x))$$

$$\exists x (P(x) \wedge Q(x)) \wedge (\forall x \neg P(x) \vee \forall x \neg Q(x))$$

$$\exists x_1 (P(x_1) \wedge Q(x_1)) \wedge (\forall x_2 \neg P(x_2) \vee \forall x_3 \neg Q(x_3))$$

$$\exists x_1 \forall x_2 \forall x_3 P(x_1) \wedge Q(x_1) \wedge (\neg P(x_2) \vee \neg Q(x_3))$$

$$P(a) \wedge Q(a) \wedge \neg P(x_2) \wedge \neg Q(x_3)$$

$$(1) P(a)$$

$$(2) Q(a)$$

$$(3) \neg(P(x_2) \vee Q(x_3))$$

Resolução: $\theta = \{x_2/a; x_3/a\}$, de 1, 3:

$$(4) \neg Q(a)$$

$$\text{De (4) e (3): (5) } \square$$

$$(3)(a) (P \wedge \neg Q) \rightarrow \neg(P \rightarrow Q)$$

$$(1) \neg((P \wedge \neg Q) \rightarrow \neg(P \rightarrow Q))$$

$$(2) (P \wedge \neg Q) \quad \text{de 1 (RC } \rightarrow)$$

$$(3) \neg(\neg(P \rightarrow Q)) \quad \text{de 1 (RC } \rightarrow)$$

$$(4) P \quad \text{de 2 (RC } \wedge)$$

$$(5) \neg Q \quad \text{de 2 (RC } \wedge)$$

$$(6) (P \rightarrow Q) \quad \text{de 3 (RN)}$$

$$(7) \neg P \quad | \quad Q \quad \text{de 6 (RD } \rightarrow)$$

$$(8) \square \quad | \quad \square$$

$$(b) \exists x (P(x) \wedge Q(x)) \rightarrow (\exists x P(x) \wedge \exists x Q(x))$$

$$(1) \neg (\exists x (P(x) \wedge Q(x)) \rightarrow (\exists x P(x) \wedge \exists x Q(x)))$$

$$(2) \exists x P(x) \wedge Q(x)$$

$$(3) \neg (\exists x P(x) \wedge \exists x Q(x))$$

$$(4) P(a) \wedge Q(b)$$

$$(5) P(a)$$

$$(6) Q(a)$$

$$(7) \neg \exists x P(x) \quad | \quad \neg \exists x Q(x)$$

$$(8) \neg P(a) \quad | \quad \neg Q(x)$$

$$9 \quad \square \quad | \quad \square$$

de (1) RC \rightarrow de (1) RC \rightarrow de (2) $\theta = \{x/a\}$ REde (4) RC \wedge de (4) RC \wedge de (3) RD \wedge de (7) RE $\theta = \{x/a\}$

$$(c) \forall x (P(x) \vee Q(x)) \rightarrow (\exists x P(x) \vee \forall x Q(x))$$

$$(1) \neg (\forall x (P(x) \vee Q(x)) \rightarrow (\exists x P(x) \vee \forall x Q(x)))$$

$$(2) \forall x (P(x) \vee Q(x))$$

$$(3) \neg (\exists x P(x) \vee \forall x Q(x))$$

$$(4) \neg (P(a) \vee Q(a))$$

$$(5) \neg P(a)$$

$$(6) \neg Q(a)$$

$$(7) P(a) \vee Q(a)$$

$$(8) P(a) \quad | \quad Q(a)$$

$$(9) \square \quad | \quad \square$$

$$(10) \square$$

de (1) RC \rightarrow de (1) RC \rightarrow de (3) RE, RV $\theta = \{x/a\}$ de (4) RC \vee de (6) RC \vee de (2) RV, $\theta = \{x/a\}$ de (7) RD \vee