

3) a)  $B, (B \wedge C) \rightarrow \neg A, B \rightarrow C \vdash \neg A$

Prova: 1. B hip. 1  
2.  $(B \wedge C) \rightarrow \neg A$  hip. 2  
3.  $B \rightarrow C$  hip. 3  
4. C 1, 3, {Modus Ponens}  
5.  $B \wedge C$  1, 4,  $\{\wedge I\}$   
6.  $\neg A$  5, 2, {Modus Ponens}

O argumento é válido.

b)  $A \rightarrow (B \vee C), \neg C \vdash A \rightarrow B$

Prova: 1.  $A \rightarrow (B \vee C)$  hip. 1  
2.  $\neg C$  hip. 2  
3.  $\neg(A \rightarrow B)$  hip. adicional  
4.  $\neg(\neg A \vee B)$  3, {Implicação}  
5.  $A \wedge \neg B$  4,  $\{\vee\text{-de Morgan}\}$   
6. A 5,  $\{\wedge E_e\}$   
7.  $\neg B$  5,  $\{\wedge E_d\}$   
8.  $B \vee C$  6, 1,  $\{\rightarrow E\}$   
9.  $\neg C \wedge \neg B$  2, 7,  $\{\wedge I\}$   
10. F 8, 9,  $\{\perp I\}$   
11.  $A \rightarrow B$  3, 10,  $\{RRA\}$

O argumento é válido

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c)  $\forall x [S(x) \rightarrow \exists y (P(x,y) \wedge T(y))], \exists x [C(x) \wedge S(x)] \vdash \exists x \exists y [C(x) \wedge T(y) \wedge P(x,y)]$

Prova:	1. $\forall x [S(x) \rightarrow \exists y (P(x,y) \wedge T(y))]$	hip. 1
	2. $\exists x [C(x) \wedge S(x)]$	hip. 2
	3. $S(a) \rightarrow \exists y (P(a,y) \wedge T(y))$	1, $\{\forall E\}$
	4. $C(a) \wedge S(a)$	2, $\{\exists E\}$
	5. $C(a)$	4, $\{\wedge E\}$
	6. $S(a)$	4, $\{\wedge E\}$
	7. $\exists y [P(a,y) \wedge T(y)]$	6, 3, $\{\rightarrow E\}$
	8. $P(a, b) \wedge T(b)$	7, $\{\exists E\}$
	9. $P(a, b) \wedge T(b) \wedge C(a)$	5, 8, $\{\wedge I\}$
	10. $\exists y [P(a, y) \wedge T(y) \wedge C(a)]$	9, $\{\exists I\}$
	11. $\exists x \exists y [P(x, y) \wedge T(y) \wedge C(x)]$	10, $\{\exists I\}$

O argumento é válido