

$$\begin{array}{c}
 (Ax) \quad (Ax) \\
 P, \neg P, U \quad \vdash \neg P (e\neg) \quad \neg P, U, P \vdash P (e\neg) \\
 \hline
 P, \neg P, U \vdash \perp (i\neg) \\
 4) \quad P, \neg P \vdash \neg U
 \end{array}$$

$$\begin{array}{c}
 (Ax) \quad (Ax) \\
 (Ax) \quad W, P \supset U, P \vdash P \quad W, P \supset U, P \vdash \neg U \\
 \hline
 W, P \supset U, P \vdash U (e\neg) \quad W, P \supset U, P \vdash \neg U (e\neg) \\
 \hline
 Ax \quad W, P \supset U, P \vdash \perp (i\neg) \\
 \hline
 W, P \supset U \vdash \neg \neg P (e\neg) \quad W, P \supset U \vdash \neg P (e\neg) \\
 \hline
 W, P \supset U \vdash \perp (i\neg)
 \end{array}$$

$$\begin{array}{c}
 \uparrow \\
 \boxed{\neg \neg P \supset U, \neg \neg P, \neg U = W} \\
 \hline
 \neg \neg P \supset U, \neg \neg P, \neg U \vdash \neg (P \supset U) (e\neg) \quad \neg \neg P \supset U, \neg \neg P, \neg U \vdash \neg \neg (P \supset U) (e\neg) \\
 \hline
 \neg \neg P \supset U, \neg \neg P, \neg U \vdash \perp (i\neg) \\
 \hline
 \neg \neg (P \supset U), \neg \neg P \vdash \neg \neg U (i\supset) \\
 2) \quad \neg \neg (P \supset U) \vdash (\neg \neg P) \supset \neg \neg U
 \end{array}$$

$$\begin{array}{c}
 (Ax) \quad (Ax) \\
 P \supset U, \neg \neg P, \neg U, P \vdash P \supset U (e\supset) \quad P \supset U, \neg \neg P, \neg U, P \vdash P (e\supset) \quad (Ax) \\
 \hline
 P \supset U, \neg \neg P, \neg U, P \vdash U (e\supset) \quad P \supset U, \neg \neg P, \neg U, P \vdash \neg U (e\supset) \\
 \hline
 (Ax) \quad P \supset U, \neg \neg P, \neg U, P \vdash \perp (i\supset) \\
 \hline
 P \supset U, \neg \neg P, \neg U \vdash \neg \neg P (e\supset) \quad P \supset U, \neg \neg P, \neg U \vdash \neg P (e\supset) \\
 \hline
 P \supset U, \neg \neg P, \neg U \vdash \perp (i\supset) \\
 \hline
 P \supset U, \neg \neg P \vdash \neg \neg U (i\supset) \\
 1) \quad P \supset U \vdash (\neg \neg P) \supset \neg \neg U
 \end{array}$$

(Ax) $(P \wedge U) \wedge P \vdash (P \wedge U) \wedge P$ (Ax) $(P \wedge U) \wedge P \vdash P \wedge U (e \wedge)$ $(P \wedge U) \wedge P \vdash (P \wedge U) \wedge P (e \wedge)$ (Ax) $P \wedge U \wedge P \vdash U (i \wedge) \quad P \wedge U \wedge P \vdash P (i \wedge) \quad (P \wedge U) \wedge P \vdash (P \wedge U) \wedge P (e \wedge)$ $(P \wedge U) \wedge P \vdash U \wedge P (i \wedge) \quad (P \wedge U) \wedge P \vdash P (i \wedge)$ $2) (P \wedge U) \wedge P \vdash P \wedge (U \wedge P)$ (Ax) (Ax) $P \wedge U \vdash P \wedge U (e \wedge) \quad P \wedge U \vdash P \wedge U (e \wedge)$ $P \wedge U \vdash P (i \wedge) \quad P \wedge U \vdash U (i \wedge)$ $P \wedge U \vdash U \wedge P$ $1)$

Conjunções

 (Ax) $W, T, (P \rightarrow U) \rightarrow P \vdash P$ (Ax) $W, T \vdash W (e \rightarrow)$ $W, T \vdash (P \rightarrow U) \rightarrow P \rightarrow P (e \rightarrow)$ $W, T \vdash U (i \rightarrow)$ $(P \rightarrow U) \rightarrow P, P \vdash U$ $W, (P \rightarrow U) \rightarrow P \vdash (P \rightarrow U) \rightarrow P (e \rightarrow) \quad W, (P \rightarrow U) \rightarrow P \vdash P \rightarrow U (e \rightarrow)$ $W, ((P \rightarrow U) \rightarrow P) \vdash P (i \rightarrow)$ $W \vdash W (e \rightarrow)$ $W \vdash ((P \rightarrow U) \rightarrow P) \rightarrow P (e \rightarrow)$ $W \vdash U$ $(((P \rightarrow U) \rightarrow P) \rightarrow P) \rightarrow U = W$ \uparrow $(((P \rightarrow U) \rightarrow P) \rightarrow P) \rightarrow U \vdash U (i \rightarrow)$ $3) \vdash (((P \rightarrow U) \rightarrow P) \rightarrow P) \rightarrow U$

