

*iv			$\vdash \sim P \rightarrow R$
	(1)	$\sim P \leftrightarrow Q$	A
	(2)	$\sim P$	A
3	(3)	$\sim Q \vee R$	_____
	(4)	$\sim P \rightarrow Q$	_____
	(5)	_____	2, 4 _____
	(6)	R	_____
	(7)	$\sim P \rightarrow R$	_____

v	$P \rightarrow Q \vdash (R \vee \sim Q) \rightarrow (P \rightarrow R)$		
	(1)	P \rightarrow Q	A
	(2)	_____	A
	(3)	P	A
	(4)	_____	1,3 \rightarrow E
	(5)	R	2,4 \vee E
	(6)	_____	5 \rightarrow I (3)
	(7)	$(R \vee \sim Q) \rightarrow (P \rightarrow R)$	6 _____

Exercise 2.1.2 Give proofs for the following sequents. All of these proofs may be completed without using the rules \rightarrow I or RAA.

- *i $P \vee \sim R, \sim R \rightarrow S, \sim P \vdash S$
- ii $P \vee \sim R, \sim R \rightarrow S, \sim P \vdash S \ \& \ \sim R$
- *iii $P \rightarrow \sim Q, \sim Q \vee R \rightarrow \sim S, P \ \& \ T \vdash \sim S$
- *iv $P \ \& \ (Q \ \& \ R), P \ \& \ R \rightarrow \sim S, S \vee T \vdash T$
- v $P \rightarrow Q, P \rightarrow R, P \vdash Q \ \& \ R$
- vi $P, Q \vee R, \sim R \vee S, \sim Q \vdash P \ \& \ S$
- *vii $\sim P, R \vee \sim P \leftrightarrow P \vee Q \vdash Q$
- viii $(P \leftrightarrow Q) \rightarrow R, P \rightarrow Q, Q \rightarrow P \vdash R$
- *ix $\sim P \rightarrow Q \ \& \ R, \sim P \vee S \rightarrow \sim T, U \ \& \ \sim P \vdash (U \ \& \ R) \ \& \ \sim T$
- x $(Q \vee R) \ \& \ \sim S \rightarrow T, Q \ \& \ U, \sim S \vee \sim U \vdash T \ \& \ U$