Truth tables

1. What does it mean (in terms of truth tables) to say that two sentences are *logically equivalent*?

2. Show that $P \to Q$ and $\neg P \vee Q$ are logically equivalent.

3. If two sentences ϕ and ψ are logically equivalent, what do we know about the sequents $\phi \vdash \psi$ and $\psi \vdash \phi$?

4. If $\phi \vdash \psi$, then what do we know about the truth tables of ϕ and ψ?

5. Find a sentence whose only connectives are $\wedge$ and $\neg$, and that is logically equivalent to $P \to Q$.

6. Can there be a correctly written proof with the following lines?

1	(1)	$P \to Q$	A
1	(n)	$Q \to P$	

Biconditional

1. Show that $\neg(P \leftrightarrow Q)$ and $P \leftrightarrow \neg Q$ are logically equivalent.

2. Can there be a correctly written proof with the following lines?

1	(1)	$\neg P \vee Q$	A
2	(2)	$\neg(Q \wedge \neg P)$	A
$1, 2$	(n)	$P \leftrightarrow Q$	

3. Prove that $P \leftrightarrow \neg P \vdash P \wedge \neg P$

4. Prove that $P \wedge Q \vdash P \leftrightarrow Q$

5. Prove that $\neg P \wedge \neg Q \vdash P \leftrightarrow Q$

New proofs from old

1. Prove that $(P \wedge Q) \vee (\neg P \wedge \neg Q) \vdash P \leftrightarrow Q$
2. Prove that $(P \rightarrow Q) \rightarrow R \vdash (\neg P \vee Q) \rightarrow R$
3. Show that if $\phi \vdash \psi$ then $\chi \rightarrow \phi \vdash \chi \rightarrow \psi$