

Start Time:

Your name:

Stop Time:

Integrity signature:

Time limit 15 minutes, not counting download and upload. Please add explanation below if over 17 minutes total.

PL axioms:

PL1: $A \rightarrow B \rightarrow A$

PL2: $(A \rightarrow B \rightarrow C) \rightarrow (A \rightarrow B) \rightarrow (A \rightarrow C)$

PL3: $\neg A \rightarrow A \rightarrow B$

PL4: $(\neg A \rightarrow A) \rightarrow A$

• $A \vee B$ and $A \wedge B$ stand for $\neg A \rightarrow B$ and $\neg(A \rightarrow \neg B)$.

An “explicit” proof means showing all the lines in the proof, not just proving that a PL-proof exists. HINT: All three explicit proofs on the quiz should have at most three lines.

1. Give explicit PL-proofs for the following formulas.

(a) $B \rightarrow (A \vee B)$.

(b) $(A \rightarrow A) \rightarrow (A \rightarrow A)$.

2. Give an explicit PL-proof showing $B \rightarrow (A \rightarrow A)$, $B \vdash A \rightarrow A$.

3. (With the aid of the deduction theorem.) Prove that $\vdash (A \wedge B \rightarrow B) \rightarrow A \wedge B \rightarrow B$.