Knowledge Check: Natural Deduction for Propositional Logic

TOTAL POINTS 4

| 1. | What rule can be used to derive $(p \wedge q) \vdash (p \wedge q) \wedge r$? | 1 / 1 point |
|----|---|-------------|
| | and-introduction | |
| | implication-elimination | |
| | and-elimination | |
| | The conclusion cannot be derived by any rule | |
| | Correct Correct! We cannot deduce the conclusion from the premises using any rules. The proof is not a valid proof. | |
| 2. | Which rules may be used to derive p $\rightarrow \neg \neg q$, p $\vdash q \land p$? | 1 / 1 point |
| | implication-elimination, implication-introduction, and and-introduction | |
| | double negation-elimination, and-introduction, and and-elimination | |
| | ouble negation-elimination, implication-elimination, and and-introduction | |
| | double negation-elimination, implication-elimination, and and-elimination | |
| | Correct Correct! To derive q∧p, we need and-introduction with both p and q. p is given and q can be derived by first applying implication-elimination and then double negation-elimination. | |
| 3. | | 1 / 1 point |

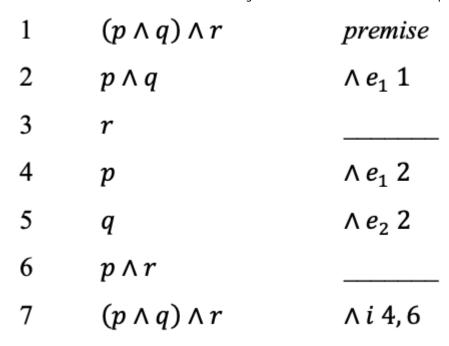


Figure 1: Derivation of $(p \wedge q) \wedge r \vdash p \wedge (q \wedge r)$

Review the figure, which gives the derivation of $(p \land q) \land r \vdash p \land (q \land r)$. However, while the derivation itself has been written out, two of the rules needed to complete the proof are missing, specifically the ones in line 3 and line 6.

In order to make the derivation correct, which proof rules are needed in lines 3 and 6?

- $\Lambda e_1 2$ in line 3, and $\Lambda i 5$, 3 in line 6
- $\Lambda e_1 1$ in line 3, and $\Lambda i 5$, 4 in line 6
- $\Lambda e_1 1$ in line 3, and $\Lambda i5$, 3 in line 6
- \bigcirc $\land e_2 1$ in line 3, and $\land i 5, 3$ in line 6

Correct

Correct! You can derive line 3 using line 1 with and-elimination, and you can derive line 6 using lines 3 and 5 with and-introduction.

- Consider this argument: "If I am guilty, I must be punished; I must not be punished. Therefore, I am not guilty." Is the argument logically correct? If so, which rules are needed to derive the conclusion?
 - Yes, the argument is logically correct. We can use negation-elimination, negationintroduction, and implication elimination.

| 0 | Yes, the argument is logically correct. We can use negation elimination, implication introduction, and implication elimination. |
|------------|---|
| 0 | Yes, the argument is logically correct. We can use and-introduction, negation-introduction, and implication elimination. |
| \bigcirc | No, the argument is <i>not</i> logically correct. |

Correct

Correct! Negation-introduction allows us to make an assumption which must then allow us to derive the bottom. This can be done using negation-elimination combined with implication