

338.001, VL Logic, Martina Seidl / Wolfgang Schreiner / Wolfgang Windsteiger, 2022W

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Started on Monday, 7 November 2022, 7:15 PM**State** Finished**Completed on** Monday, 7 November 2022, 7:30 PM**Time taken** 14 mins 47 secs**Grade** 4.60 out of 5.00 (92%)**Question 1**

Correct

Mark 2.00 out of 2.00

Flag question

Given propositional formula

$$(\neg c) \wedge (a \vee b \vee c) \wedge (d \vee \neg a) \wedge (e \vee \neg b) \wedge (\neg f \vee \neg c) \wedge (\neg a \vee \neg b) \wedge (\neg d \vee e) \wedge (\neg e \vee \neg c) \wedge (\neg f \vee \neg c)$$

Which two clauses given in the list below can be derived with one or more applications of the resolution rule?

(Keep in mind that disjunction is commutative, i.e., the order of literals in a clause is irrelevant).

Select one or more:

- ☒ 1. $(\neg a \vee \neg c)$ ✓
- ☒ 2. $(d \vee e \vee \neg f)$ ✓
- ☐ 3. empty clause
- ☐ 4. $\neg a$
- ☐ 5. $(d \vee e \vee f)$

Die Antwort ist richtig.

The correct answers are: $(d \vee e \vee \neg f)$, $(\neg a \vee \neg c)$ **Question 2**

Partially correct

Mark 1.60 out of 2.00

Flag question

Which of the following rules are applicable on sequent $\neg(a \wedge (\neg c \vee d))$, $\neg e$, $a \vdash \neg a \wedge b$?

Select one or more:

- ☐ 1. This is an axiom.
- ☒ 2. $P\text{-}\neg$ ✗
- ☒ 3. $P\text{-}\wedge$ ✓
- ☐ 4. $A\text{-}\wedge$
- ☐ 5. $P\text{-}\vee$
- ☐ 6. $A\text{-}\vee$
- ☒ 7. $A\text{-}\neg$ ✓

Die Antwort ist teilweise richtig.

You have selected too many options.

The correct answers are: $P\text{-}\wedge$, $A\text{-}\neg$ **Question 3**

Correct

Mark 1.00 out of 1.00

Flag question

Which of the following proofs are correct derivations in the sequent calculus (note that labels of the rules have been omitted).

Select one or more:

☐ a.

$$\frac{\frac{\frac{a, a \vdash b}{a \vdash (a \vee b)}}{\neg \neg a \vdash (a \vee b)} \quad \frac{\vdots}{\neg(a \vee b) \vdash \neg b}}{\frac{\neg(a \vee b) \vdash \neg a \quad \neg(a \vee b) \vdash \neg b}{\neg(a \vee b) \vdash (\neg a \wedge \neg b)}} \quad \frac{\neg \neg \neg(a \vee b) \vdash (\neg a \wedge \neg b)}{\vdash (\neg \neg(a \vee b) \vee (\neg a \wedge \neg b))} \quad \vdots$$

$$\frac{\vdash (\neg \neg(a \vee b) \vee (\neg a \wedge \neg b)) \quad \vdash (\neg(\neg a \wedge \neg b) \vee \neg(a \vee b))}{\vdash (\neg \neg(a \vee b) \vee (\neg a \wedge \neg b)) \wedge (\neg(\neg a \wedge \neg b) \vee \neg(a \vee b))}$$

☐ b.

$$\frac{a, a \vdash b}{a \vdash b}$$

$$\begin{array}{c}
 \frac{\neg\neg a \vdash (a \vee b)}{\neg(a \vee b) \vdash \neg a} \quad \frac{\vdots}{\neg(a \vee b) \vdash \neg b} \\
 \hline
 \neg(a \vee b) \vdash (\neg a \wedge \neg b) \\
 \hline
 \neg\neg\neg(a \vee b) \vdash (\neg a \wedge \neg b) \\
 \hline
 \vdash (\neg\neg(a \vee b) \vee (\neg a \wedge \neg b)) \quad \vdots \\
 \hline
 \vdash (\neg\neg(a \vee b) \vee (\neg a \wedge \neg b)) \wedge (\neg(\neg a \wedge \neg b) \vee \neg(a \vee b))
 \end{array}$$

☐ c.

$$\begin{array}{c}
 \frac{a, \neg a \vdash b}{a \vdash (a \vee b)} \\
 \hline
 \frac{\neg\neg a \vdash (a \vee b)}{\neg(a \vee b) \vdash \neg a} \quad \frac{\vdots}{\neg(a \vee b) \vdash \neg b} \\
 \hline
 \neg(a \vee b) \vdash (\neg a \wedge \neg b) \\
 \hline
 \vdash ((a \vee b) \vee (\neg a \wedge \neg b)) \\
 \hline
 \vdash (\neg\neg(a \vee b) \vee (\neg a \wedge \neg b)) \quad \vdots \\
 \hline
 \vdash (\neg\neg(a \vee b) \vee (\neg a \wedge \neg b)) \wedge (\neg(\neg a \wedge \neg b) \vee \neg(a \vee b))
 \end{array}$$

☒ d.

$$\begin{array}{c}
 \frac{a, \neg a \vdash b}{a \vdash (a \vee b)} \\
 \hline
 \frac{\neg\neg a \vdash (a \vee b)}{\neg(a \vee b) \vdash \neg a} \quad \frac{\vdots}{\neg(a \vee b) \vdash \neg b} \\
 \hline
 \neg(a \vee b) \vdash (\neg a \wedge \neg b) \\
 \hline
 \neg\neg\neg(a \vee b) \vdash (\neg a \wedge \neg b) \\
 \hline
 \vdash (\neg\neg(a \vee b) \vee (\neg a \wedge \neg b)) \quad \vdots \\
 \hline
 \vdash (\neg\neg(a \vee b) \vee (\neg a \wedge \neg b)) \wedge (\neg(\neg a \wedge \neg b) \vee \neg(a \vee b))
 \end{array}$$

Die Antwort ist richtig.

$$\begin{array}{c}
 \frac{a, \neg a \vdash b}{a \vdash (a \vee b)} \\
 \hline
 \frac{\neg\neg a \vdash (a \vee b)}{\neg(a \vee b) \vdash \neg a} \quad \frac{\vdots}{\neg(a \vee b) \vdash \neg b} \\
 \hline
 \neg(a \vee b) \vdash (\neg a \wedge \neg b) \\
 \hline
 \neg\neg\neg(a \vee b) \vdash (\neg a \wedge \neg b) \\
 \hline
 \vdash (\neg\neg(a \vee b) \vee (\neg a \wedge \neg b)) \quad \vdots \\
 \hline
 \vdash (\neg\neg(a \vee b) \vee (\neg a \wedge \neg b)) \wedge (\neg(\neg a \wedge \neg b) \vee \neg(a \vee b))
 \end{array}$$

The correct answer is:

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