

**TUTORS:**

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**QUESTIONS:** Please don't hesitate to ask any questions. Questions help you and your peers.**PRINT:** Please consider the environment before printing the exercise.**1 NNF Rules**

$$A \Rightarrow B \rightarrow \neg A \vee B$$

$$A \Leftrightarrow B \rightarrow (\neg A \vee B) \wedge (A \vee \neg B)$$

$$\neg(A \vee B) \rightarrow \neg A \wedge \neg B$$

$$\neg(A \wedge B) \rightarrow \neg A \vee \neg B$$

$$\neg\neg A \rightarrow A$$

$$\neg\exists x A \rightarrow \forall x \neg A$$

$$\neg\forall x A \rightarrow \exists x \neg A$$

**2 ALC to NNF**

Convert the following ALC axioms into Negation Normal Form (NNF)

- $\neg(A \sqcup \neg B)$
- $\neg(\neg(A \sqcup \neg B) \sqcap \neg C)$
- $\neg(A \sqsubseteq B) \sqcup (C \sqsubseteq D)$
- $\neg(\forall r. A \sqcup B)$