

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

$$\begin{aligned}
 A \Rightarrow B &\rightarrow \neg A \vee B \\
 A \Leftrightarrow B &\rightarrow (\neg A \vee B) \wedge (A \vee \neg B) \\
 \neg(A \vee B) &\rightarrow \neg A \wedge \neg B \\
 \neg(A \wedge B) &\rightarrow \neg A \vee \neg B \\
 \neg\neg A &\rightarrow A \\
 \neg\exists x A &\rightarrow \forall x \neg A \\
 \neg\forall x A &\rightarrow \exists x \neg A
 \end{aligned}$$

2 ALC to NNF

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

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

3 SHACL Shapes

Consider the following SHACL shapes graph:

```

@prefix ex: <http://example.org/> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix sh: <http://www.w3.org/ns/shacl#> .

```

```

ex:PersonShape
  a sh:NodeShape ;
  sh:targetClass ex:Person ;
  sh:property [
    sh:path ex:name ;
    sh:datatype xsd:string ;
    sh:minLength 3 ;
    sh:maxLength 20 ;
  ] .

```

Based on the provided SHACL shapes graph, write an RDF data graph that conforms to the defined constraints.