Rules: rules like this

$h \leftarrow b$

$p(x,y,z) \leftarrow q(x,y) \wedge \exists w: r(y,z) \wedge \ldots$

allow this?
allow ¬ ?
...
⇒ DBT lecture

Mai 9-14:06

variable-restricted subsets of FOL: x–z–y

$\forall x,y:$ isUncle(x,y) ← ∃z: hasChild(y,z) ∧ sibling(x,z)

→ need 3 variables

IsUncle(x) "x is an uncle of something"

∀x: IsUncle(x) ← ∃z: (sibling(x,z) ∧ ∃x: child(z,x))

syntactically: use only two vars: x, z

blue x

scope of x

DL expression:

"≈ class concept" → Uncle ≡ Person ⊓ ∃sibling.(∃child.Person)

sibling, child

Parent ≡ Person ⊓ ∃child.Person

Uncle ≡ Person ⊓ ∃sibling.Parent

Adult ≡ Person ⊓ ∃age ≥ 18

Bla = Male ⊓ Female

⤳ Bla must be empty!
"inconsistent class"

Mai 9-14:32

Slide 52 Example:

$LL \sqsubseteq Italian$
$LL \sqsubseteq Person$
$LL \sqsubseteq Gentleman$
$LL \sqsubseteq English$

Ontology: $Italian \sqcap English \equiv \emptyset$

$\models LL \sqsubseteq English \sqcap Italian$
$\models LL \sqsubseteq \emptyset$
$\Rightarrow LL$ is inconsistent

from "Query":
$Italian \sqsubseteq Lazy \sqcup LL$
$\models Italian \sqsubseteq Lazy$

Mai 9-14:56

modulo ring

e.g. $\mathbb{Z}_5$

$= \{0, 1, 2, 3, 4\}$ $\quad \# = 5$

double of 0 : 0
1 2
2 4
3 ... 6 mod 5 → 1
4 .... 8 ..... → 3

Mai 9-15:06

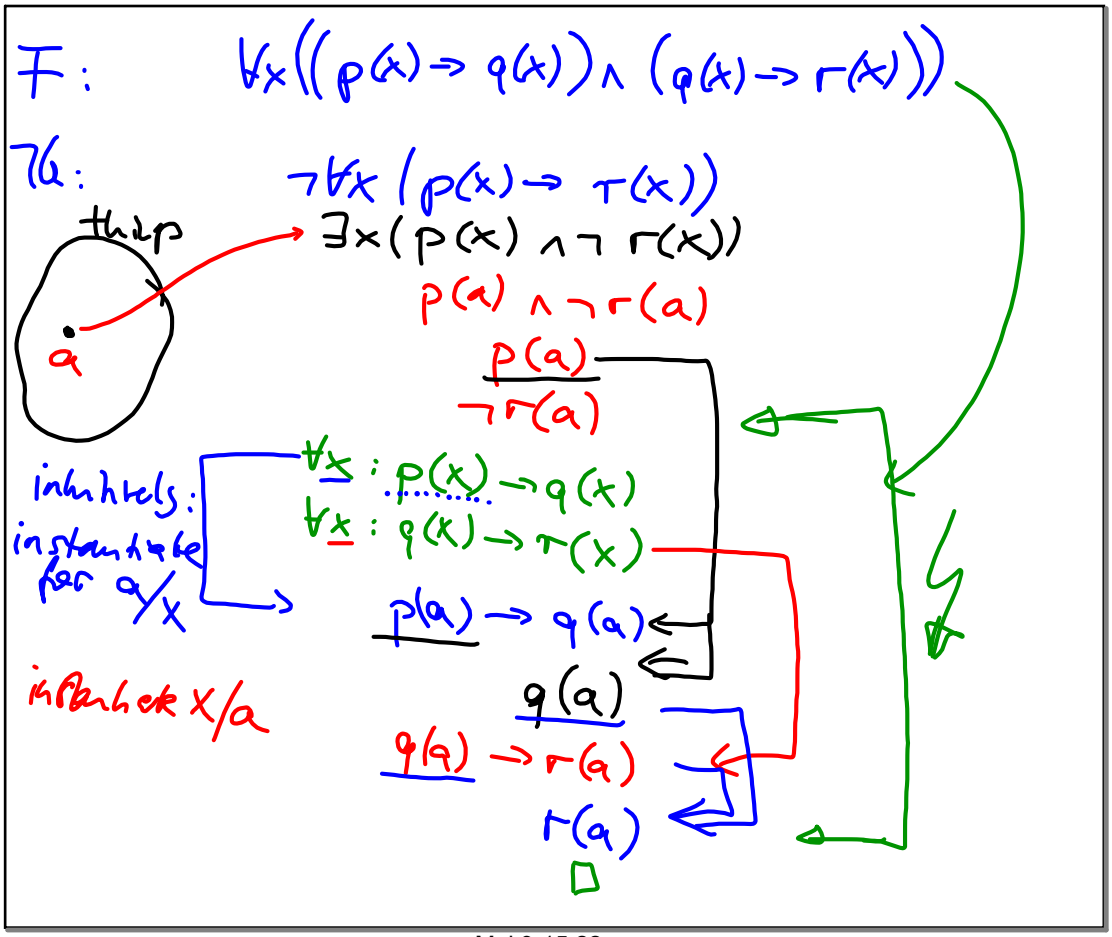
prove that $F \models G$

$\Leftrightarrow$ show that $F \wedge \neg G$
- is inconsistent
- has no models
- is unsatisfiable
- is impossible

F
$\neg G$

→ hard slide

Mai 9-15:21



Mai 9-15:22

example modus ponens:

axiom $\forall x\,(\text{rains} \rightarrow \text{umbrella}(x))$

fact rains

there is alice

$\Longrightarrow$ instantiate rule

$x \rightarrow \text{alice}$

$\sigma(x) = \text{alice}$

$$\frac{\text{rains} \rightarrow \text{umbrella}(\text{alice}),\ \text{rains}}{\text{umbrella}(\text{alice})}$$

Mai 9-15:34

$\forall x\, \exists y: \text{parent}(x,y)$

$\exists y: \text{parent}(X_1, y)$

$\exists y\ \text{parent}(X_2, y)$

$\text{parent}(X_1, f(X_1))$

$\text{parent}(X_2, f(X_2))$

Mai 9-15:46