

Slide 1

Administrivia

- (None.)

Slide 2

Propositional Logic Versus Predicate Logic

- In propositional logic:
 - Wffs are true or false, depending on assignment of truth values to statement letters.
 - If a wff is true for all such assignments, “tautology” — always true.
 - Can show this by checking all cases (truth table).
- In predicate logic:
 - Wffs are true or false (or neither, if they have free variables), depending on “interpretation” (domain plus meanings for predicates and constants).
 - If a wff is true for all such interpretations, “valid” — always true.
 - *Cannot* show this by checking all cases.

Valid Arguments, Revisited

Slide 3

- As with propositional logic, we want to know when we can say that a conclusion “logically follows” from a set of hypotheses — i.e., no matter what interpretation we choose, if the hypotheses are true so is the conclusion.
- What we have in our “bag of tricks”:
 - All propositional-logic rules.
 - New rules for manipulating quantifiers.

Universal Instantiation

Slide 4

- Rule for removing \forall . (Why do we want to do this?)
- If we have $(\forall x)P(x)$
we can write $P(t)$
provided t doesn't already exist “bound” in $P(x)$.
- “If $P(x)$ for all x , then $P(t)$ for a particular t ”.

Existential Instantiation

- Rule for removing \exists . (Why do we want to do this?)
- If we have $(\exists x)P(x)$
we can write $P(t)$
provided t has not been previously used in the proof.
- “If there is some x for which $P(x)$, we can give it a name — t , for example.”

Slide 5

Universal Generalization

- Rule for introducing \forall . (Why do we want to do this?)
- If we have $P(x)$
we can write $(\forall x)P(x)$
provided x is “arbitrary” — not a free variable in a hypothesis, not a variable we got from ei, not a free variable in a formula we got from ei. (For last part, consider example at bottom of p. 49.)
(Yes, this is tricky to understand/apply.)
- “If we know $P(x)$ for arbitrary x , then $P(x)$ for all x .”
- Review problem 9 section 1.4.

Slide 6

Existential Generalization

Slide 7

- Rule for introducing \exists . (Why do we want to do this?)
- If we have $P(y)$ or $P(a)$
we can write $(\exists x)P(x)$
provided x doesn't appear in $P(a)$.
- "If we have some particular z for which $P(z)$, then there exists a z such that $P(z)$."

Examples

Slide 8

- Section 1.4 problems 7 and 9. (If time permits.)

Minute Essay

- None — quiz.
- (Quiz solution will usually be on Web shortly after class.)

Slide 9