Predicates and Quantifiers

CSE015 Lab 3, 2024 Fall

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Slides is posted on Canvas:Files. If you find any typos or have any concerns, please contact me ASAP!

1.4 Exercise

- **Determine truth value of predicates**: 1, 2
- **Determine truth value of quantifiers**: 11, 19, 37
- **Interpret predicates and quantifiers**: 7
- **Logical equivalence containing quantifiers**: 35, 36

Logical Equivalence Involving Quantifiers

- **De Morgans laws for quantifiers**: $\neg\forall x P(x) \equiv \exists x \neg P(x)$ and $\neg\exists x Q(x) \equiv \forall x \neg Q(x)$.
- Example 19: $\forall x(P(x) \wedge Q(x)) \equiv \forall x P(x) \wedge \forall x Q(x)$.
- Example 22: $\neg\forall x(P(x) \rightarrow Q(x)) \equiv \exists x(P(x) \wedge \neg Q(x))$.

Truth value of $\exists$ and $\forall$

Prove by cases:

- Prove $\exists x P(x)$ to be True: give an example such that $P(x)$ holds.
- Prove $\forall x P(x)$ to be False: give an example such that $P(x)$ does NOT hold.

We have not covered yet (will be introduced in 1.7, 1.8):

- Prove $\forall x P(x)$ to be True.
- Prove $\nexists x P(x)$ to be True.

1.5 Exercise

- **Interpret nested quantifiers**: 1, 2, 3, 4
- **Symbolize into nested quantifiers**: 10, 16
- **Determine truth values of nested quantifiers**: 16, 28, 34
- **Logical equivalence containing nested quantifiers**: 30, 31, 32, 33