1 First-Order Logic

1.1 Elements of First Order Logic

First order logic is comprised of four main elements. They are as follows:

Objects: can give these names such as Umbrella0, Person0, John, Earth

Relations: Carrying(., .), IsAnUmbrella(.). Relations with one object are called unary relations

Functions:are different than relations because they return objects. For example: Roommate(Person0)

Equality: Roommate(Person0) = Person1

1.2 Reasoning

Variables: are used to refer to objects

New operators "for all" and "there exists", also known as **universal quantifier** and **existential quantifier**

1.3 Examples

Please see slide 7 and 8 for more practice on using these.

1.4 Substitution

SUBST replaces one or more variables with something else.

For example, the substitution:

SUBST(x/John, IsHuman(x) => NOT(IsDog(x)))

Results in:

IsHuman(John) => NOT(IsDog(John))

1.5 Skolem Function

Existential quanitifers can be replaced using Skolem Functions. For example, when for all x, there exists a y that ...., you can instead Skolemize and say for all x, but this time, remove there ists a y and all occurrences of y get replaced with f(x).