

## CSE 390Z: Mathematics for Computation Workshop

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### QuickCheck: Predicate Logic Solutions (due Monday, October 16)

Please submit a response to the following questions on Gradescope. We do not grade on accuracy, so please submit your best attempt. You may either typeset your responses or hand-write them. Note that hand-written solutions must be legible to be graded.

We have created [this template](#) if you choose to typeset with Latex. [This guide](#) has specific information about scanning and uploading pdf files to Gradescope.

#### 0. English to Logic Translation

Translate the following English statements to predicate logic:

**Domain of Discourse:**  $D := \text{"Mammals"}$

**Predicates:**

$\text{Walks}(x, y) := \text{"}x \text{ walks } y\text{"}$   
 $\text{Dog}(x) := \text{"}x \text{ is a dog"}$   
 $\text{Human}(x) := \text{"}x \text{ is a human"}$   
 $\text{Friends}(x, y) := \text{"}x \text{ and } y \text{ are friends"}$

(a) Humans are not friends with each other.

**Solution:**

$$\forall x \forall y ((\text{Human}(x) \wedge \text{Human}(y)) \rightarrow \neg \text{Friends}(x, y))$$

(b) All humans are friends with the dogs that they walk.

**Solution:**

$$\forall x \forall y ((\text{Human}(x) \wedge \text{Dog}(y) \wedge \text{Walks}(x, y)) \rightarrow \text{Friends}(x, y))$$

(c) Every human walks exactly one dog.

**Solution:**

$$\forall x (\text{Human}(x) \rightarrow \exists y (\text{Dog}(y) \wedge \text{Walks}(x, y) \wedge \forall z ((\text{Dog}(z) \wedge (z \neq y)) \rightarrow \neg \text{Walks}(x, z))))$$

#### 1. Video Solution

Watch [this video](#) on the solution **after** making an initial attempt. Then, answer the following questions.

(a) What is one thing you took away from the video solution?

(b) What topic from the quick check or lecture would you most like to review in workshop?