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ENG/20M

CSCE 531 Homework 1

1. Let be the statement “ has a cat,” let be the statement “ has a dog,” and let be the statement “ has a ferret.” Express each of these statements in terms of , , , quantifiers, and logical connectives. Let the domain consist of all students in your class.
   1. A student in your class has a cat, a dog, and a ferret.
   2. For each of the three types of animals, there is a student in your class who has one of these animals as a pet.
2. (Problem 36) Find counterexamples, if possible, to these universally quantified statements, where the domain for all statements consists of all real numbers.
3. (Inspired by Problem 28) Determine the truth value of each of these statements if the domain of each variable consists of all real numbers. You may need to refer to Appendix 1.

True. We can square any real number, so just let .

False. We cannot square a number and obtain a negative result. For example, no value of , when squared, can give a result of .

True. Let .

False. By the commutative property, in all cases.

True, because all numbers have a multiplicative inverse. In this case, let .

False. Let . When , , but when , .

True. Let .

False. . Regardless of and , we cannot force an equation to give two different answers (in this case, and ).

False. Let . To satisfy the left side of the conjunction, . However, , so there is no that satisfies the equation when .

True. The average of two real numbers is always a real number, so we can always find a value for such that .