Solutions

Quiz 3: Sections 1.3-1.4

1. (4 points) In the domain of all books, consider the following predicates.

$H(x)$= "x is heavy."
$C(x)$= "x is confusing."

Translate the following statements from predicate logic into ordinary English or vice versa.

(a) All heavy books are confusing. $(\forall x)(H(x) \to C(x))$

(b) Some books are confusing and heavy. $(\exists x)(C(x) \wedge H(x))$

(c) $(\forall x)(C(x) \vee H(x))$ Every book is either confusing or heavy.

(d) $(\exists x)(H(x) \wedge \neg C(x))$ Some books are heavy, but not confusing.

2. (3 points) The domain for this problem is some unspecified collection of numbers. Consider the predicate

$P(x, y)$= "x is greater than y."

(a) Translate the following statement into predicate logic.

Every number has a number that is greater than it.

(b) Negate your expression from part (a), and simplify it so that no quantifier or connective lies within the scope of a negation.

(c) Translate your expression from part (b) into understandable English. Don't use variables in your English translation.

(a) $(\forall x)(\exists y)P(y,x)$

(b) $(\exists x)(\forall y)\neg P(y,x)$

(c) There is a number which is greater than all other numbers.

3. (3 points) Draw a model for the axiomatic system of four-point geometry, where a "line" is a line segment, a "point" is an endpoint of a line segment, and a point "is on" a line if it is one of its endpoints.