

Your Name:

Duration of the Quiz is 30 minutes. There are five problems, worth 20 points. Show all your work for full credit. Books, notes etc. are prohibited. Calculators are NOT permitted.

1. Determine the truth value of each of these statements if the domain consists of all real numbers.

(i)  $\exists x(x^3 = -1)$

(iii)  $\forall x((-x)^2 = x^2)$

(ii)  $\exists x(x^4 < x^2)$

(iv)  $\forall x(2x > x)$

2. For each of these statements find a domain for which the statement is true and a domain for which the statement is false.

(i) Everyone speaks Spanish.

(ii) There is someone older than 21 years.

(iii) Every two people have the same first name.

(iv) Someone knows more than two other people.

3. Express each of these statements using quantifiers. Then form the negation of the statement, so that no negation is to the left of a quantifier. Next, express the negation in simple English.

(i) No rabbit knows calculus.

(ii) Every bird can fly.

(iii) There is no dog that can talk.

(iv) There is no one in this class who knows French and Russian.

4. Translate each of these statements into logical expressions using predicates, quantifiers, and logical connectives.

(i) Something is not in the correct place.

(ii) All tools are in the correct place and are in excellent condition.

(iii) Everything is in the correct place and in excellent condition.

5. Translate these statements into English, where  $R(x)$  is “ $x$  is a rabbit ” and  $H(x)$  is “ $x$  hops ” and the domain consists of all animals.

(i)  $\forall x(R(x) \rightarrow H(x))$

(iii)  $\forall x(R(x) \wedge H(x))$

(ii)  $\exists x(R(x) \rightarrow H(x))$

(iv)  $\exists x(R(x) \vee H(x))$