Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Math 2150

Summer 2014

**Homework 2 (written part) Upload or turn in a hard copy**

1. Let p(x,y) mean "x likes y". For example p(Jack , Jill) means Jack likes Jill and and means everyone likes him or herself.Also let x = y mean the ususal equality relation. For example means there exist two distinct people, neither of which likes the other.

Express each of the following in logic:

* 1. There's a person who likes everybody.
  2. Everyone has someone they like.
  3. Everybody has someone that likes them.
  4. There’s a person who is liked by everyone.
  5. There exist three distinct people, neither of which likes either of the other two.
  6. Not everyone likes everybody. *(Equivalent to “There is someone who doesn’t like somebody”)*
  7. No one is liked by everybody. *(Equivalent to “Everyone has somebody who doesn’t like them.”)*
  8. There is some person who isn't liked by anyone other than him or herself.
  9. Every person is liked by at least one other person besides him or herself.
  10. If someone is liked by at least two other people then the person like him or herself.
  11. There exist two people that have no person in common whom they both like.
  12. Anyone who likes only him or herself is unliked by anyone else.
  13. There exist three distinct people such that a first person likes a second person and the second likes the third but the first doesn’t like the third. (In other words, the likes relation isn’t transitive.)

1. Let **pred(x,y)** mean "x is the predecessor y" in the domain of Integers (i.e. x = y – 1 ). Express each of the following in logic. (You’ll want to use = in some of these.)
2. Every number is the predecessor of some number.
3. Every number has a predecessor.
4. No number has two distinct predecessors.
5. No number is the predecessor of two distinct numbers.
6. No number is its own predecessor.
7. The predecessor of an even number is not even. Use even(x) to mean x is even.
8. For any x and y, x is less than y if and only if x is the predecessor of y or x is less than the predecessor of y. Use x < y to mean x is less than y.
9. “For any integer n, if n2 – 1 *isn’t* a multiple of 3 then n *is* a multiple of 3”. Is this statement true?? If it is, then give a proof. If is isn’t then give a counterexample.
10. Consider the set S of numbers that can be written in the form p + q , where p and q are rational numbers. For example ( – 3 ) /7 would be in S since we can write it as (-3/7) + (5/7) . On the other hand 4 + is not in S since it’s not equal to any number of the form p + q , where p and q are rational. Prove that the quotient of any two nonzero elements of S is an element of S.