Conjunction | P ^ Q | P and Q

Disjunction | P v Q | P or Q

Implication/Conditional | P → Q | if P then Q

Biconditional | P ↔ Q | P if and only if Q

Negation | ¬P | not P

Existential quantifier | Ǝx(x<0) | There exists (there is) (there is a number less than 0

A

Universal quantifier | x(x ≥ 0) | For all (for all numbers greater than or equal to 0)

Is an element of | x ∈ {a, b, c} | x is an element of a, b, c

Natural numbers | x ∈ ℕ | x is an element of natural numbers (0, 1, 2, 3, ….)

Subsets | A ⊂ B | A is a subset of B

Subsets | A ⊆ B | A is equal to or a subset of B

Power set | Ƥ(A) | set of sets, all of which are subsets of A.

Cardinality | |A| = 6 | The size of set A is 6 elements

Write a predicate calculus statement that involves a **universal** and an **existential** **quantifier**. The domains for each quantifier should be one of the numeric sets, the natural numbers, the integers, the rational numbers or the real numbers. Indicate whether the statement is true or false. If it is false, provide a counterexample. Write the negation of the original statement. If the negation is false, provide a counter example.

Hello,

My job for the Navy, at times, can deal with some very high level mathematics.  Here is what I came up with for this week's discussion and is derived from the relationship of bits per symbol in a communication signal and the number of phase states that signal contains.  As such:

∀x ∈ ℕ (∃y ∈ ℝ (y = 2π/2x )) : x = bits per symbol

Translation: For every natural number *x* there is a real number *y* where y = *2π/2x*

If a signal uses 2 bits per symbol (x), then it uses 4 phase changes (2^2 = 4) and there for y = *π/2* radians or 90 degrees.  This statement will always be true.

The negation to this that I came up with still makes the statement true:

¬∃x ∈ ℕ (∀y ∈ ℝ (y ≠ 2π/2x )) : x = bits per symbol

Translation: There is not a natural number *x* for any real number *y* where *y ≠ 2π/2x*

In the negation, *x = 3*, and *y = 2π/8*or*π/4*(45 degrees).  There is not a way using the function of x as *2π/2x*that would make this negation true.

Cheers  
Joe