

Section 13.2 - Predicate Calculus

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1 Writing Things in Predicate Notation with Quantifiers

1.1 Examples:

Let C = the set of all cars registered in New York State.

For all $c \in C$, Define $r(c)$ to mean car c is red. Write the following in Predicate calculus.

1. All cars are red.
2. There are cars that are not red.
3. It is not true that all cars are red.
4. There are no cars that are red.

1.2 More Examples

Let S = the set of all students in Brooklyn College, and let C = the set of courses offered at Brooklyn College.

For all $c \in C$ and $s \in S$, Define $T(s, c)$ to mean student s is taking course c . Write the following in Predicate calculus.

1. There exist some students who take discrete math.
2. All students take calculus.
3. There are some students who don't take any courses.

2 De Morgan Laws for the Predicate Calculus

- $\neg(\exists x p(x)) \iff \forall x \neg p(x)$
- $\neg(\forall x p(x)) \iff \exists x \neg p(x)$

3 Examples

Write the following without using $\neg$ at the beginning.

1. Not every prime number is odd.
2. For $\sqrt{2}$, there do not exist p and q such that $\sqrt{2} = \frac{p}{q}$.
3. Not all cars are red.