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Axiom of Descent and Binary Mathematical Problems

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ABSTRACT: *We use a previously introduced us the concept of binary mathematical statements and the axiom of descent for the solution of some open in number theory problems.*
KEYWORDS: *Prime numbers, the number of twins, Primes at a distance of 4, 6, 8, …*

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I. INTRODUCTION

In [1-3] we considered one class o mathematical problems called binary, specified axiom of natural numbers Peano, adding the axiom of descent, which is the interpretation of the so-called method of descent of Fermat [4], by which he proved his conjecture about Diophantine equations for the particular case $n = 4$.
In [5] it is stated that the American mathematician Ethan Zhang made an important step: it is proved, that there is an integer N such that the set of pairs of primes p, q with the condition $p - q = N$ is infinite. Note that we in our work [6], published in Russian proved that of Prime twins infinitly many and also solved the problem of Hardy and Littlvud [7,367] proof of the existence of infinitely many such triples of primes: $p, p' = p + 2,$ and $p'' = p + 6$ and four primes: $p, p' = p + 2, p'' = p + 6, p''' = p + 8$, and so on … . Thus, we have proved not only the existence of integers N such that the set of pairs of primes p, q with the condition $p - q = N$ is infinite, and have find a particular number N for which this condition will be executed. Apparently American readers have not had the opportunity to read [6]. Axiom, as a rule, is not proved. For example, the fifth postulate of Euclid was formulated without proof yet before our era, and existed in perfect healthup to 1826. In 1826 N.I. Lobachevsky [8] discovered that this postulate is quite a particular case in geometry when the curvature of space is zero. So, in 1826 appeared geometry of space with negative curvature. Mathematics from ancient times to 1826, i.e. more than 2000 years, thought that the fifth postulate of Euclid is a theorem that can be deduced from other postulates. It is for this reason that N.I. Lobachevsky recognized only 60 years after its discovery and 30 years after his death. Such recognition of non- Euclidean geometry came only after the opening of Beltrami relevant surfaces, where is performed planimetry of Lobachevsky. It seem to us that the same situation takes place with our axiom of descent, though using this axiom, we solved a large number [6], [9] of open problems in number theory

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1. The use of the axiom of descent to the proof of some binary problems;

First of all, let us recall [1] the mathematical definition of a binary statement from the natural parameter n .

Definition 1. An mathematical statement A_n , depending on natural parameter n we will call binary if for any value $n = \alpha$ the statement A_α has one or the other values: truth or lie.

Axiom of descent [9]: let A_n will be the binary statement from natural parameter n such that:

1. There is an algorithm which for any value n gives the answer to the question “statement A_n truth or lie”;

2. For values of parameter $n_1 < n_2 <,,,< n_k$ the statements $A_{n_1}, A_{n_2},..., A_{n_k}$ are true, and for any $n_{k+1} > n_k$ the statement $A_{n_{k+1}}$ is fals.

Then the statement A_n is true for infinitely many values n.

We list without proof the assertions proved in [2], [6], [9] with the help of the axiom of descent.

Theorem 1. [9] Natural number $2^k(2^{k+1}-1), k \geq 1$ is perfect if and only if si $2^{k+1}-1$ is a Prime number.

In the proof of the theorem the axiom of descent is used in the proof that all odd numbers are not perfect.

Theorem 2. [9] The set of numbers Mersenne is infinite.

Corollary 1. The set of numbers perfect is infinite.

Corollary 2. A sequence of numbers 2^n-1, where $n = 1,2,3,\ldots$ contains an infinite number of Prime numbers.

Theorem 3. [9] (Binary problem Euler-Goldbach) Each even number starting with 4 may be represented as a sum of two primes.

Corollary (Euler) Each odd number starting with 7 may be represented as a sum of three primes.

Theorem 4. [9] Slightly excessive numbers is not exist.

Theorem 5. [2] If n is a Prime number, $n \geq 3$, then 2^n+1 is the product of $3p$, where p is a Prime number of the form $4n-1$, i.e. not representable as a sum of two squares.

This theorem to us delivers an algorithm of search of large Prime numbers.

Theorem 6. [2] All the numbers in sequence $2^{2^n}+1, n = 1,2,3,4,\ldots$, are numbers of the form $4n+1$ and representable as a sum of two squares.

Theorem 7. [2] The sequence of integers $2^{2^n}+1, n = 1.2.3.4,\ldots$contains infinitely many Prime numbers.

We will notice that according to [7, 38] the first Prime number of the type $2^{2^n}+1$, superior $2^{2^4}+1$ satisfies the inequality $n \geq 17$.

Theorem 8. [6] The set Prime twins is infinite.

Every finite sequence of Hardi and Littlvud $p_1, p_2,..., p_k$ with perhaps a small difference [7,367] occurs $p_k - p_1 = 2(k-1)$. This statement is obviously binary is proved according to the General scheme of the proof using the axiom of descent. This implies that for any even integer $2k, k = 1,2,\ldots$ there are un infinite number of pairs Prime p, p' such that $p' - p = 2k$. Hence obvious follows the result of Ethan Zhang, which we mentioned in section 1.

II. CONCLUSIONS

Thus, before the article given the solution to many problems from number theory, which have so far remained open, and the solution of these problems is based only on the use of the axiom of descent.

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