МУРМАНСКАЯ АКАДЕМИЯ ДЕКАРТОВОЙ ИНФИНИТОЛОГИИ И ЕВКЛИДОВЫХРАКТАЛОВ
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# THE ELEMENTARY PRINCIPLES OF THE MATHEMATICAL INFINITOLOGY

## Very short Introduction into the practical Infinitology and the arithmetical proof of the Riemann hypothesis

**Theory and practice of presentation of the usual natural numbers and their numerous consequences in view of perfect sets of dots in standard rectangular system of Cartesian 2D & 3D coordinates.**

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## Abstract

In this Article, “The elementary principles of the mathematical infinitology”, is briefly but clearly told about the trivial (non-computer’s) scientific-and-practical method of creating the dotted color illustrations of not only the natural numbers themselves but even their complex-algebraic analogies in xy rectangular system of Cartesian coordinates. This method is based on the re-invented by this Article author the well-known in mathematics such an idea as “the Ulam’s table-cloth”, belonging to the famous American scientist S.M.Ulam. Thanks to his own methods, the Author has managed to create graphically, in xy or 2D Cartesian coordinates, the unusual mathematical color dotted scientific plots from the usual natural numbers and formed by them consequences and derivations not only in the vicinity of “null-point” of these coordinates but at any distance from it.Such illustrations have opened a wide road for investigating the most complicated idea in the Number theory where the prime and twin numbers are among them. And, at last, the Science has received the long- time-expected means or instrument for studying and investigation the Cartesian or mathematical infinity ( $\pm\infty$: xy & xyz ) as the really existing part and the most modern chapter of the independent division in the elementary Arithmetic, Algebra, Geometry and the Calculus or higher mathematics as well.



Key words: The Cartesian infinitology, the mathematical plus-minus infinity($\pm\infty$:xy & xyz), the Cartesian coordinates, natural prime and twin numbers, the Theory of Intervals, the ”sieve of Erathosfen”, “the Ulam’s spiral”, etc.

**Karpushkin Evgeny Vassilyevich**

# The elementary principles of the mathematical infinitology.

## Principles of the modern theory and practice of scientific-and-mathematical infinitology.

**Evgeny V. Karpushkin**

## Abstract.

The modern Science has now a lot of its branches and meanders, where are working the numerous specialists and outstanding scientists everywhere in the whole world. The theme of this article is devoted to mathematics in general and to its such a new subsidiary science as the Cartesian infinitology ( ± ∞ : x y & x y z ) in a whole.

The young and adult modern people of our time, among them, in first turn, are such ones as the usual citizens, students or schoolchildren, have a very poor imagination about those achievements and successes that made by our scientists in the different parts and divisions of many fundamental sciences, especially in mathematics. This article is a short description of the numerous ideas of a new science that is named by its inventor as the mathematical infinitology.

The infinity as the scientific category is a very complicated conception and the difficult theme for professional discussing of its properties and features even by the academicians and the Nobelists as well. In spite of all problems, the author have found his own road to this Science and worked out independently, even not being a mathematician at all, the universal, from his point of view, and unusual theories and scientific methods, which helped him to find and name It as the mathematical infinitology, that may be now studied in rectangular system of Cartesian or other coordinates, in orthogonal ones, for example, as easy and practically as we study the organic chemistry or Chinese language at the middle school or in the University.

The mathematical infinitology, as a separate or independent science, has been never existed in the mathematics from the ancient times up to the 90-th years of the XX-th century. All outstanding mathematicians of the past times were able only approximately to image to themselves and explain to their colleagues and pupils in addition, what is an infinity indeed: the scientific abstraction or the natural mathematical science that can be not only tested by one's tooth or touched by hands, but study and investigate it in schools or the Institutions of higher learning too.

In summer 1993, such a specific mathematical object as the "cloth of Ulam", was occasionally re-invented by the article author without no one imagination, what it is indeed. Very long time working hours spent by the inventor with this mathematical toy or the simplest logical entertainment helped him to penetrate into the mysteries of this usual intellectual mathematical object and see in it the fantastic perspectives and possibilities as for science as for himself in further studying and it investigating. In a result of the own purposefulness and interests to the re-invented mathematical idea of the famous American mathematician S.M.Ulam, the new science was born in the World, and after long time experiments, it was named as the mathematical or Cartesian infinitology ( ± ∞ : x y & x y z ).

## **Introduction**.

*To my friend Vladimir A. Skalny is devoted.*

In any, praiseworthy hobby, business or the craft, being appeared at the human persons for a long time process of evolution, and thanks to the mental and creative abilities growth, sometimes among the advanced people were developed such high spheres of human knowledge or personal skills or intellectual abilities, that a lot of centuries and even the millenniums came or passed away, before some difficult scientific idea or the secrets of the craft could be at last found their final decisions or they were transformed by the human individuals into such form of the representation or embodiment, available for their natural perception by people, specialists or scientists, that a team of higher skilled experts could only recognize this or that decision as a perfect standard. And, it isn't necessary to go far very much for the examples! The most ancient and the unresolved task is a secret of natural prime numbers, the cornerstone of the scientific theory of their knowledge and studying was put by Eratosphen Kirensky, the Ancient Greece mathematician, being lived in the III century B.C. The knowledge by the human persons of the Great truths of the World, was always, from the time of immemorial destiny, the elite of possessing advanced thinkers being had a rich life experience. Such people-the unique just always were able and solved the various and most important tasks of their time, advancing thereby not only the era itself and its potential opportunities, but at the same time they were putting by own affairs and talents the progress and forward advance of Mankind on the evolution steps, un-looking on all difficulties and adversities of the daily occurrence, with their terrible wars, epidemics, personal problems and the natural cataclysms.

And here is already 21 century ! It is now improbably interesting to look backward to compare the life of people, which were living at the very beginning of our era, with today's life of people that are living now in 2013 A.D. The huge abyss between these two eras is more than evident. Everything was changed considerably and up to beyond recognition ! And though the different natural and technogenous misfortunes still annoy to people and their countries, the states and even the whole continents, but what, after all abundance, a huge variety of all forms, and views and types and everything in our civilization! The flights in space and the working Hadron collider became already our daily occurrence. And there is already a future man’s struggle against the asteroid danger. And the Cheliabinsk fire-ball has showed to the whole world how terrible and dangerous can it be to all living beings on the Earth. It is the most convenient time to think about the security of the Mankind, and its planet too, from the space stone travelers already today. And at soon the possible flights of people to Mars, Venus and other planets of Solar system will be begun. And the wide development of new opportunities of the Arctic and Antarctica areas with their infinite store rooms of minerals and sea bio-sources, in the nearest future! And the problem of shortage of food and drinking water consumption !!! And the catastrophic climate surprises which provoke high-speed thawing of the ice armor of the Earth ! The life on the Earth became more unpredictable and dangerous. And in this very quickly changing world, it is difficult to the human person correctly and in due time to react to all misfortunes that are collapsing upon his head from the side of the natural disasters.

Being live rapidly and in the atmosphere of continuous changes, the modern human person, nevertheless, doesn't low his hands down and continues to create the material and intellectual treasures elsewhere on the Earth, and even in the outer space, making better, step by step, not only the created by him achievements but this very complicated World too, on the base of his own imperfections. The people constantly live in continuous creative search, solving the mass of tasks, for what they are sometimes encouraged morally or financially. For the sake of such bright perspectives of the personal wellbeing, the best minds start to look for the solution of the most difficult scientific tasks and other problems. And the valuable awards sometimes find the heroes! This work is a formal confirmation of the man’s elementary inquisitiveness and how it helped him to make an interesting scientific invention in sphere of elementary mathematics.

## The rectangular mathematical spiral or “the table-cloth of Ulam”.

Even some a few people among the today's schoolchildren and students know and can convincingly, even on fingers, explain what it is the "Eratosphen’s sieve" and / or the " Ulam's spiral", and at least to tell elementarily about these objects, and what it is spoken about in principle. And not all mathematician will be also able to explain objectively and clearly to the ordinary fans of this science, what it is a "bestia" named as the spiral of Ulam, and what are the concrete advantages from it to the science itself, to the ordinary fellow citizens and, especially, to the modern educated people of the world as well. If to judge on the single publications only, the mathematical idea of Mr.S.M.Ulam, the famous American mathematician and the Polish man in his original, is not be able to serve as a proof that our authors–educators and the legal distributors of the scientific-and-popular literature on mathematics among the population, have the elementary interest to this, in appearance, the childish mathematical occupation and these persons are not sure very much that they could be objectively and in details to tell for their readers, on the pages of the famous books, about the features of this idea. But what kind of the mathematical interest may have this a childish mathematical entertainment at readers in fact ?

As it is well known today, Stanislav M. Ulam has invented this "cloth", or rather, a spiral, in 1963, being presented once upon a time at a very boring meeting of his colleges-scientists. To kill time and not to fall asleep with boredom, our hero began to draw on the page of his note-book in cell a symbolic chessboard for solution of etudes, but, occasionally, he has changed his intention and, instead of the chess figures drawing, he begun to fill in the center of this, a poor similarity of the chessboard, with the natural prime numbers in view of the points situated in square cells of the spiral-typed line, turning anticlockwise, that replaced such prime numbers as two, three, etc. As for me, I have made the same even not being introduced with this idea at all and its author in general. Both Ulam and me have replaced the prime numbers with the points for simplification of the whole work. And at soon, the idea of the American mathematician, which was named as "the Ulam's cloth" by the scientists, was born and, by the time, it has possessed the right to live. Specialists of Los-Alamos laboratory, headed by Stanislav Martin Ulam, the author of this idea, did a huge work on detection the regularities of prime numbers distribution within this helicoid system, but the idea, as it is known, couldn't demonstrate itself in its entire beauty since it was needed a perfect modification a little. But just on this trifle, the time was absent at S.Ulam and his colleges. So it’s a pity! Because Stanislav Martin Ulam and his friends in this laboratory have been on the threshold of the Great discovery in mathematics, and, as it is supposed by me, in sphere of the elementary number theory.

The Generalized spiral of Ulam

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 82 | **81** | 80 | **79** | 78 | 77 | 76 | 75 | 74 | **73** |
| **83** | 50 | **49** | 48 | **47** | 46 | 45 | 44 | **43** | 72 |
| 84 | 51 | 26 | **25** | 24 | **23** | 22 | 21 | 42 | **71** |
| 85 | 52 | 27 | 10 | **09** | 08 | 0**7** | 20 | **41** | 70 |
| 86 | **53** | 28 | **11** | **02** | **01** | 06 | **19** | 40 | 69 |
| 87 | 54 | **29** | 12 | 0**3** | **04** | 0**5** | 18 | 39 | 68 |
| 88 | 55 | 30 | **13** | 14 | 15 | **16** | **17** | 38 | **67** |
| **89** | 56 | **31** | 32 | 33 | 34 | 35 | **36** | **37** | 66 |
| 90 | 57 | 58 | **59** | 60 | **61** | 62 | 63 | **64** | 65 |
| 91 | 92 | 93 | 94 | 95 | 96 | **97** | 98 | 99 | **100**…→ ∞ |

Even such a small site of mathematical object under the name "Ulam's table-cloth" allows to see the fine accurate chains of the natural numbers-points on the Fig.1-3 below and in the [LI]

**Author’s classification of the natural numbers in the “table-cloth of Ulam”**

I. 1,2,3,4,5,6,7,8,9,10,11,12,…--- the usual natural numbers consequence;

I.' 1,3,5,7,9,11,13,15,17,19,21 --- the odd natural numbers consequence,…

I.'' 2,4,6,8,10,12,14,16,18,20,…--- the even natural numbers consequence,

II. 2,3,5,7,11,13,17,19,23,31,…--- the natural prime numbers consequence;

III. 3-5,5-7,11-13,29-31,41-43,…--- the natural twin numbers consequence;

IV. 1,9,25,49,81,121,169,196,… --- the squares of the odd natural numbers consequence;

V. 4,16,36,64,100,144,196,… --- the squares of the even natural numbers consequence;

VI. 1,11,31,41,61,71,101,131,… --- the first kin type of prime numbers consequence;

VII. 3,13,23,43,53,73,83,103,… --- the second kin type of prime numbers consequence;

VIII. 7,17,37,47,67,97,107,127,… --- the third kin type of prime numbers consequence;

IX. 19,29,59,79,109,139,149,… --- the forth kin type of prime numbers consequence;

X. 1,3,11,13,23,31,41,43,53,… --- the fifth kin type of prime numbers consequence;

XI. 1,7,11,17,31,37,41,47,61,… --- the sixth kin type of prime numbers consequence;

XII. 1,11,19,29,31,41,59,61,71,…--- the seventh kin type of prime numbers consequence;

XIII. 3,7,13,17,23,37,43,47,53,… --- the eighth kin type of prime numbers consequence;

XIV. 3,13,19,23,29,43,53,59,73,…--- the ninth kin type of prime numbers consequence;

XV. 7,17,19,29,37,47,59,67,79,…--- the tenth kin type of the prime numbers consequence;

XVI. 1,3,7,11,13,17,23,31,37,41,…--- the eleventh kin type of prime numbers consequence;

XVII. 1,3,11,13,19,23,29,31,41,…--- the twelfth kin type of prime numbers consequence;

XVIII.1,7,11,17,19,29,31,37,41,… --- the thirteenth kin type of prime numbers consequence;

XIX. 3,7,13,17,19,23,29,37,43,… --- the fourteenth kin type of prime numbers consequence;

XX. 11-13,41-43,71-73,101-103,…--- the 1-st kin of the twin prime numbers consequence;

XXI. 17-19,107-109,137-139,… --- the 2-nd kin of the twin prime numbers consequence;

XXII. 29-31,59-61,149-151,… --- the 3-d kin of the twin prime numbers consequence;

XXIII. 11-13,17-19,41-43,71-73,…--- the 4-th kin of the twin prime numbers consequence;
XXIV. 11-13,29-31,41-43,59-61,…--- the 5-th kin of the twin prime numbers consequence;
XXV. 17-19,29-31,59-61,107-109, --- the 6-th kin of the twin prime numbers consequence.

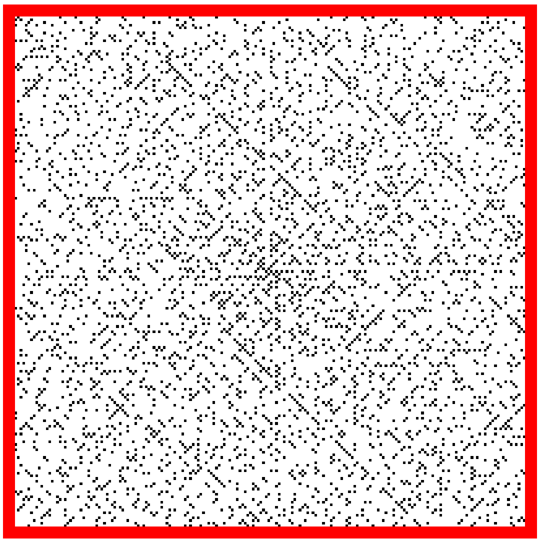

**Fig. 1. The mathematical rectangular spiral or “the table-cloth of Ulam” (fragment).**
**( the black points are the symbol prime numbers on the white field )**

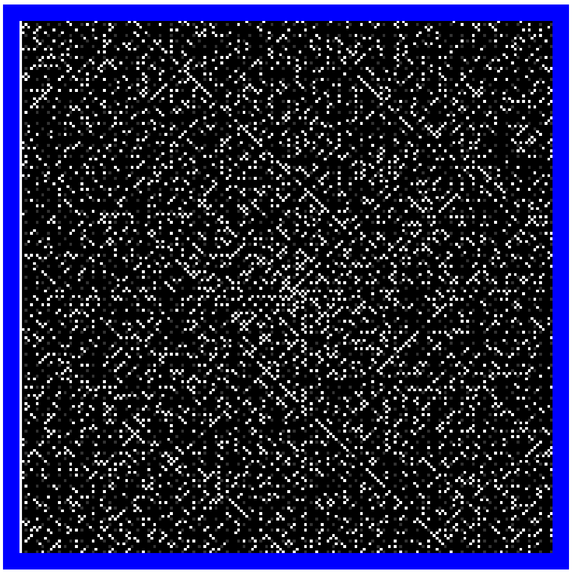

**Fig 2.The same mathematical rectangular spiral or “the table-cloth of Ulam” (fragment).**
**( the white points are the symbol prime numbers on the black field )**

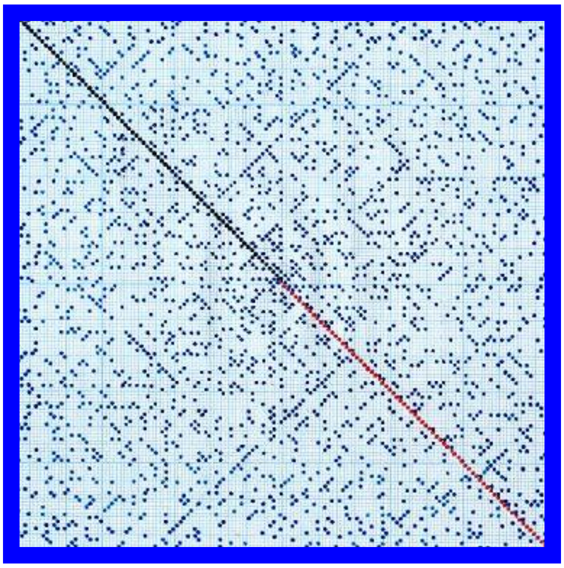

**Fig. 3. The same but generalized mathematical spiral or “the table-cloth of Ulam”. (the dark-blue points are the symbol prime numbers; the green points are the symbol odd quadratic numbers; the red points are the symbol even quadratic numbers on the white field. The fig. was made by the Author of the article after careful number coordinates calculation.**

The "Ulam's table-cloth" accurate chains of the natural numbers and their analogs in view of sets of the same dots on the different color fields (white, light-blue and black)) are demonstrating the variants of regularity of the natural number distribution in the spiral of Ulam.

But if to look at this peculiar roll from numbers indifferently, of course, it is nothing interesting will be found in this spiral. For those fifty years, which have passed from that day, when Stanislav Ulam has invented this "toy", who wasn't attracted only by it to check up one’s intellect and satisfy one’s vanity playing with this, in appearance, the usual ordinary numerical spiral! But nobody was able to see or understand its most important and basic features. May be this “cat in the bag” was “sitting” there up to the end of the times on a scientific shelf or in corner of the old store-room or a hose or rectangular "boa" rounded tightly and forgotten by everybody for ever, if once upon a time, exactly twenty years ago, the author of these lines also decided but occasionally to solve one simple arithmetic problem. In the course of its decision, when all known methods were tried without results, suddenly the entertainment of my student's years came to my mind---a mathematical rectangular spiral, which sometimes should be drawn by me at very boring lectures. In my student years during the boring lectures, I created the spiral of natural numbers and marked the natural prime numbers situated in cells of it, on the page of my student’s note-book exactly as it was made by Stanislav Ulam, (that I known much later, having looked through the mountains of mathematical literature). I have been already ready to end my empty occupations with this spiral. When I wanted to find the possible decision of my arithmetic task, when, at the last moment, I have noticed one strangeness, which strongly intrigued and surprised me: I noticed, that all squares of odd natural numbers at this spiral ideally correctly were situated on the diagonal leaving the center of this spiral and gone to the left corner, but the squares of even natural numbers---to the opposite side of the spiral [F2]. ..

And then a great willing has come to my mind --- to fulfill the graphical generalization of this elementary spiral. But to do so, one ought to me to make a huge volume of calculations and graphical works. And for the aim to receive a fine and interesting picture --- beautiful and demonstrated one ---, it has been decided to mark the suitable natural numbers with the dots of the corresponded color. In a result, the natural prime and twin numbers have been coded with the dots of blue-dark color, the squares of the odd natural numbers have become the green and the squares of the even natural numbers and the null too ---- the red ones. Such simple color coding or marking of the natural numbers have made the powerful and strong basement for a new scientific idea and the future new mathematical science. And later, after deep studying of it, this idea has been named as the “Generalized spiral of Ulam”. It is graphical interpretation is shown on the Fig. 2

**Generalized mathematical spiral or “the table-cloth of Ulam”**
**(fragment)**

82 **81** 80 **79** 78 77 76 75 74 **73**

**83** 50 **49** 48 **47** 46 45 44 **43** 72

84 51 26 **25** 24 **23** 22 21 42 **71**

85 52 27 10 **09** 08 0**7** 20 **41** 70

86 **53** 28 **11** **02** **01** 06 **19** 40 69

87 54 **29** 12 0**3** **04** 0**5** 18 39 68

88 55 30 **13** 14 15 **16** **17** 38 **67**

**89** 56 **31** 32 33 34 35 **36** **37** 66

90 57 58 **59** 60 **61** 62 63 **64** 65

91 92 93 94 95 96 **97** 98 99 **100**…→ ∞

**Fig. 4 Generalized spiral or “the table - cloth of Ulam”**

## Analogs and derivations of the Generalized spiral of Ulam.

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At once and immediately, when was determined the main information about such a strange and even the mysterious scientific object as the spiral of Ulam, there were begun the longest searching of more detailed descriptions of such spiral in the suited editions, publications, and manuals on mathematics. But having reconsidered the hills of books and handbooks on the elementary and higher mathematics, I was not able to find the information about this neither the spiral nor the generalized analog of it. Having supposed that this idea has not even the elementary interest and attention at the mathematicians, I begun to study this “toy” independently, being made my own varieties of this spiral for differentiation of my own entertainment only. In a result of my interactivity, the most improbable compositions have begun to appear from the natural numbers, which, after replacement the natural numbers on the color dots, I have received their own names like these ones: triangular, trapeziform, zigzag, and so on. There are some types and kinds of such number compositions below, that have been created on the base of my big interest and my own version of the Generalized spiral of Ulam too.

21

22 7 20

23 8 **1** 6 19

24 **9** 2 3 **4** 5 18

**25** 1 11 12 13 14 15 **16** 17

26 27 28 29 30 31 32 33 34 35 **36**

**Fig. 5 Triangular spiral. {$A_n$} = {n}**

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 50 | **49** | | | | | | |
| | | | | | 51 | 26 | **25** | 48 | | | | | |
| | | | | 52 | 27 | 10 | **9** | 24 | 47 | | | | |
| | | | 53 | 28 | 11 | 2 | **1** | 8 | 23 | 46 | | | |
| | | 54 | 29 | 12 | 3 | **4** | 5 | 6 | 7 | 22 | 45 | | |
| | 55 | 30 | 13 | 14 | 15 | **16** | 17 | 18 | 19 | 20 | 21 | 44 | |
| 56 | 31 | 32 | 33 | 34 | 35 | **36** | 37 | 38 | 39 | 40 | 41 | 42 | 43 |

**Fig. 6 Trapeziform spiral. $\{A_n\} = \{n\}$**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 131 | | | | | | | | | | |
| 109 | 129 | | | | | | | | | |
| 89 | 107 | 127 | | | | | | | | |
| 71 | 87 | 105 | 125 | | | | | | | |
| 55 | 69 | 85 | 103 | 123 | | | | | | |
| 41 | 53 | 67 | 83 | 101 | **121** | | | | | |
| 29 | 39 | 51 | 65 | **81** | 99 | 119 | | | | |
| 19 | 27 | 37 | **49** | 63 | 79 | 97 | 117 | | | |
| 11 | 17 | **25** | 35 | 47 | 61 | 77 | 95 | 115 | | |
| 05 | **09** | 15 | 23 | 33 | 45 | 59 | 75 | 93 | 113 | |
| **01** | 03 | 07 | 13 | 21 | 31 | 43 | 57 | 73 | 91 | 111 |

**Fig. 7 Zigzag spiral. $\{A_n\} = \{2n - 1\}$**

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | 99 | **100** |
| | | | | | | | | | | | | | | | | 80 | **81** | 98 | 101 |
| | | | | | | | | | | | | | | 63 | **64** | 79 | 82 | 97 | 103 |
| | | | | | | | | | | | | 48 | **49** | 62 | 65 | 78 | 83 | 96 | 104 |
| | | | | | | | | | | 35 | **36** | 47 | 50 | 61 | 66 | 77 | 84 | 95 | 105 |
| | | | | | | | | 24 | **25** | 34 | 37 | 46 | 51 | 60 | 67 | 76 | 85 | 94 | 106 |
| | | | | | | 15 | **16** | 23 | 26 | 33 | 38 | 45 | 52 | 59 | 68 | 75 | 86 | 93 | 107 |
| | | | | 8 | **9** | 14 | 17 | 22 | 27 | 32 | 39 | 44 | 53 | 58 | 69 | 74 | 87 | 92 | 108 |
| | | 3 | **4** | 7 | 10 | 13 | 18 | 21 | 28 | 31 | 40 | 43 | 54 | 57 | 70 | 73 | 88 | 91 | 109 |
| 0 | **1** | 2 | 5 | 6 | 11 | 12 | 19 | 20 | 29 | 30 | 41 | 42 | 55 | 56 | 71 | 72 | 89 | 90 | 110 |

**Fig. 8 Serpentine spiral. $\{A_n\} = \{n\}$**

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 223 | 221 | 219 | 217 | 215 | 213 | 211 | 209 | 207 | 205 | 203 | 201 | 199 | 197 | 195 |
| **225** | 143 | 145 | 147 | 149 | 151 | 153 | 155 | 157 | 159 | 161 | 163 | 165 | 167 | 193 |
| 227 | 141 | 119 | 117 | 115 | 113 | 111 | 109 | 107 | 105 | 103 | 101 | 99 | **169** | 191 |
| 229 | 139 | **121** | 63 | 65 | 67 | 69 | 71 | 73 | 75 | 77 | 79 | 97 | 171 | 189 |
| 231 | 137 | 123 | 61 | 47 | 45 | 43 | 41 | 39 | 37 | 35 | **81** | 95 | 173 | 187 |
| 233 | 135 | 125 | 59 | **49** | 15 | 17 | 19 | 21 | 23 | 33 | 83 | 93 | 175 | 185 |
| 235 | 133 | 127 | 57 | 51 | 13 | 7 | 5 | 3 | **25** | 31 | 85 | 91 | 177 | 183 |
| 237 | 131 | 129 | 55 | 53 | 11 | **9** | 0 | **1** | 27 | 29 | 87 | 89 | 179 | 181 |

**Fig. 9. Funnel-shaped spiral. $\{A_n\} = \{2n - 1\}$**

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | | | | | | | | 90 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | 91 | |
| | | | | | | | | | | | 24 | | 32 | | | | 48 | 54 | | 62 | | | 74 | | 84 | 92 | |
| | | | | | | | | | | | **25** | | 33 | | | | **49** | 55 | | 63 | | | 75 | | 85 | 93 | |
| | | | | | | 8 | | 14 | | 20 | 26 | | 34 | 38 | | 44 | 50 | 56 | | **64** | 68 | | 76 | 80 | 86 | 94 | 98 |
| **0** | | | | | | **9** | | 15 | | 21 | 27 | | 35 | 39 | | 45 | 51 | 57 | | 65 | 69 | | 77 | **81** | 87 | 95 | 99 |
| | **1** | | | **4** | 6 | 10 | 12 | **16** | 18 | 22 | 28 | 30 | **36** | 40 | 42 | 46 | 52 | 58 | 60 | 66 | 70 | 72 | 78 | 82 | 88 | 96 | **100** |
| | | **2** | **3** | **5** | **7** | **11** | **13** | **17** | **19** | **23** | **29** | **31** | **37** | **41** | **43** | **47** | **53** | **59** | **61** | **67** | **71** | **73** | **79** | **83** | **89** | **97** | **101** |

**Fig. 10. The interminable "The New-York silhouette". $\{A_n\} = \{n\}$**

If to look attentively and carefully at the [F3-9] natural number compositions, we then will not be able to un-notice a new and very interesting feature --- the square powers of the odd and even natural numbers, as usual, have created again their special configurations and such a manner, that the noticed at the Generalized spiral of Ulam un-ordinal peculiarity to form their individual sets and subsets in view of the consequent chains of red and green dots, is nowhere broken in its new verities. Such a peculiarity is more persuasive than any words can say, that perhaps a new and nobody known property of usual natural numbers is found in mathematics. The further investigations of this property, discovered at the natural numbers, allowed to recognize it as the universal low at them and at their algebraic-and-complex equivalents as well, and it has been officially registered in the State notary office, in the Murmansk Regional town center, situated on Kola peninsula, in Russia.

## Triangular structure.

When, as it was seemed, the all possible variants and varieties of the Generalized spiral of Ulam were invented and compiled, it is naturally the idea has appeared to create a new natural number configuration in view e.g. of pyramid or isosceles rectangular triangle, standing on one of its sides[F11]. In a new variant one more variety of the Generalized spiral of Ulam, it suddenly has been discovered that the spiral of Ulam, written in such a manner, is principally differ from its previous variants on the external view and other parameters (i.e. red and green dots had other configurations at the schematic diagram). In this triangular structure were seen clearly the counters of the famous and well-known to every one in mathematics the second order curve - the parabola itself.

**01**

02 03

**04** 05 06

07 08 **09** 10

11 12 13 14 15

**16** 17 18 19 20 21

22 23 24 **25** 26 27 28

29 30 31 32 33 34 35 **36**

37 38 39 40 41 42 43 44 45

46 47 48 **49** 50 51 52 53 54 55

56 57 58 59 60 61 62 63 **64** 65 66

67 68 69 70 71 72 73 74 75 76 77 78

79 80 **81** 82 83 84 85 86 87 88 89 90 91

92 93 94 95 96 97 98 99 **100** 101 102 103 104 105

106 107 108 109 110 111 112 113 114 115 116 117 118 119 120

**121** 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136

137 138 139 140 141 142 143 **144** 145 146 147 148 149 150 151 152 153

**Fig. 11 Triangular stepped structure. $\{A_n\} = \{n\}$**

**1**<br>
x x<br>
**4** x x<br>
x x **9** x<br>
x x x x x<br>
**16** x x x x x<br>
x x x **25** x x x<br>
x x x x x x x **36**<br>
x x x x x x x x x<br>
x x x **49** x x x x x x<br>
x x x x x x x x **64** x x<br>
x x x x x x x x x x x x<br>
x x **81** x x x x x x x x x x<br>
x x x x x x x x **100** x x x x x<br>
x x x x x x x x x x x x x x x<br>
**121** x x x x x x x x x x x x x x x<br>
x x x x x x x **144** x x x x x x x x x

**Fig. 12. The same Triangular stepped structure. $\{A_n\} = \{n\}$**

**Septenary low of the natural numbers chromaticity coding.**

After a successful creating of three dotted multi-colored graphs and plots in the rectangular system of Cartesian coordinates, the most unusual and interesting idea has born suddenly as “Eureka !” at Archimedes. It suddenly dawned upon me and the main result of such a premonition, presented here like the Classification table, was the idea of creating the dotted scientific illustration, the mathematical interpretation or close similarity to it would be a formula $\{A_n\} = \{n\}$, where the “n” is any natural number, marked in a view of the dot having the only possible color for this figure. But because of the absence of the axioms and the already written rules on the natural numbers color coding, this idea has taken me unawares, and I was needed, by all means, to find, invent or work out such method of natural number color coding at once, immediately and independently.

Later, in a result of the purposefulness and own interest, this difficult task was decided in the shortest time and much enough successfully. To be more specific, any natural number in the endless consequence of them, one can code (mark) now with the only color, and as for any figure color marking, it will be needed only seven “paints” of the rainbow spectrum for these purposes. The rules of color natural number coding is presented here in the Classification table below, taking, of course, in our mind, that each figure on the picture or a plot is represented there in a view of the suited color dot. Let us introduce with the elementary color coding rules of the natural numbers and their complex-and-algebraic equivalents as well.

**Classification Table**

1. Any odd natural number, arisen in “( )^2” or any other “( )^2n” power, is coded in view of the green dot(s), e.g.: $1^2 = 1$, $3^2 = 9$, $5^2 = 25$, etc. The same but the negative odd numbers ( -1, -9, -25, etc.) must be marked in such a manner, i.e. in view of the green dot(s) on the plot or graph, created in the Cartesian coordinates.

2. Any even natural number, arisen in “( )^2” or any other “( )^2n” power, is coded in view of the red dot(s), e.g.: $2^2 = 4$, $4^2 = 16$, $6^2 = 36$, etc. The same but the negative even numbers ( - 4, -16, - 36, etc.) must be marked in such a manner, i.e. in view

of the red dot(s) on the plot or graph, created in the Cartesian coordinates.

3. Any natural prime or twin numbers must be coded in view of the blue dot(s), e.g.: 2 = 2, 3 = 3, 5 = 5, etc. The same but the negative numbers (-2, -3, -5, etc.) must be marked in such a manner, i.e. in view of the blue dot(s) on the plot or graph, created in the Cartesian coordinates.

4. Any odd natural number, arisen in "( )^3" or any other "( )^(2n-1)" power, is coded in view of the dark blue dot(s), e.g.: $3^3 = 27$, $5^3 = 125$, $7^3 = 343$, etc. The same but the negative numbers ( - 27, - 125, -343, etc.) must be marked in such a manner, i.e. in view of the dark blue dot(s) on the plot or graph, created in the Cartesian coordinates, excluding the natural ( negative ) numbers, which fall under the condition of the item No.1 of this Classification, e.g.: $9^3 = [(3^2)]^3$, etc.

5. Any even natural number, arisen in "( )^3" or any other "( )^(2n-1)" power, is coded in view of the violet dot(s), e.g.: $2^3 = 8$, $6^3 = 216$, $2^9 = 512$, etc. The same but the negative numbers( - 8, - 216,- 512, etc.)must be marked in such a manner, i.e. in view of the violet dot(s) on the plot or graph , created in the Cartesian coordinates, excluding the natural( negative ) numbers, which fall under the condition of the item No. 2 of this Classification, e.g.: $4^3 = [(2^2)]^3$, etc.

6. All other odd natural ( negative ) numbers are coded in view of the yellow dot(s), e.g.:15, 21, 33, 35, 39, 45, 51, 55, etc., when created the plot or graph in Cartesian coordinates.

7. All other even natural ( negative ) numbers are coded in view of the orange dot(s), e.g.: 6, 10, 12, 14, 18, 20, 22, 24, etc., when created the plot or graph in Cartesian coordinates.

Such a simple method of any natural number color classification in a view of the dot, having the own color among the seven paints of the rainbow spectrum, will allow to create for us not only the most unusual scientific and art "pictures" but even the fantastic dotted illustrations and compositions in the rectangular system of Cartesian coordinates in the vicinity of its "null"- point and at any distance from it. The modern programmable media products such ones of them as MAPLE, MathCAD, MATHEMATICA, MATLAB, WOLFRAM, etc., will help to strength the opportunities for our scientists-mathematicians and specialists in sphere of IBM PC programming up to the endless indeed.

And, probably, some new scientific inventions will be made as in mathematics as in physics, chemistry, astronomy and other famous sciences and their branches. And, may be, at last, the mathematical or Cartesian plus-minus infinity ( $\pm\infty$ : x y & x y z ) will tell to its investigators all secrets of the prime numbers, twin numbers, proof the conjunction of B.Riemann and explain a lot of other outstanding scientific and mathematical problems of the past centuries and modern ones additionally.

**Very short Introduction into the theory and practice of creating the prime number (interminable) dotted plots in 2D Cartesian coordinates.**

For many years of existence from the day of its official presentation in the Scientific mathematical World, the famous idea, invented or declared by B. Riemann and named by the mathematicians in his honor, has already had the respectable theoretical and illustrative base, but nobody from the scientists was able to proof at nowadays the Riemann's hypothesis (2017.03.01), even having taken into account such an interesting motivation as the promise of the Clay Mathematics Institute, situated in the USA, to award the happy Client with 1 M $. This hypothesis is perhaps waiting for its own personal Carl Gauss, Andrew Wiles or Gregory Perelman to close this idea successfully and with a triumph for this story.

Let us try to approaching without much ado to the elementary understanding and feelings to its far "redoubts" or the natural prime numbers themselves but with a help of "the sieve of Erathosfen" and "the Generalized spiral of Ulam" that have already being mentioned earlier, in this Article, when created the red-and-green dotted plots in the 2D Cartesian coordinates.

As it was spoken above in the text, the invented by the Author a wonderful number property allows to create the perfect chains or sets from the red and green dotted lines in 2D Cartesian coordinates, if coding the quadratic odd and even natural numbers with suited color. Such idea occasionally helped to use them for investigating these unusual plots. In a result, we have got the wonderful pictures of these numbers in suited limits along the number axis and in the correspondent scale in addition (Fig. 14). As we are known very well now, all initially a very difficult fulfilled work made by Author for creating the first dotted plot is carried up now very easy indeed and without any kind of difficulties.The valuable practical experience being received by Author in this process of making the first most plot has helped him very much again, during the prime and twin natural number plots creating in 2D Cartesian coordinates (Figs. 15-16).

On the dotted prime number plot, one can find a lot of unusual elements of the unknown scientific nature, and it is impossible to explain them with the current mathematical rules and theories. First of all, it is the interminable vertical "strip", consisting of two --- one by one --- "empty" cells in width. No one blue dot, that is being an equivalent of the prime number, is situated in any cell of such two component vertical grating. It is the ideal picture and the illustration for explanation of that idea that the prime numbers have not the occasional placing in the number consequence. Secondly, such empty vertical "tubing" is speaking very clearly and without the proof itself that the prime number distribution or, by other words, their dispersion in the number consequence is absolutely perfect and correct despite nobody of scientists could find the mathematical rule or the scientific law in their unforeseen consequence and non-understandable from the logical point of view. This new method of natural numbers presentation in general and the prime numbers in private can confirm a new scientific idea birthing in the Science to study the natural numbers and their equivalents in 2D Cartesian coordinates (Fig.13)↓.

**12** 11 10 09 08 **07** 06 **05** 04 **03** **02** 01 **00** 01 **02** **03** 04 **05** 06 **07** 08 09 10 **11** 12 **13** 14 15 16 **17**
**11** 10 09 08 **07** 06 **05** 04 **03** **02** 01 **00** 01 **02** **03** 04 **05** 06 **07** 08 09 10 **11** 12 **13** 14 15 16 **17** 18
09 08 **07** 06 **05** 04 **03** **02** 01 **00** **01** **02** **03** 04 **05** 06 **07** 08 09 10 **11** 12 **13** 14 15 16 **17** 18 **19** 20
06 **05** 04 **03** **02** 01 **00** **01** **02** **03** 04 **05** **00** **07** 08 09 10 **11** 12 **13** 14 15 16 **17** 18 **19** 20 21 22 **23**
**02** 01 **00** 01 **02** **03** 04 **05** 06 **07** 08 **00** **00** **11** 12 **13** 14 15 16 **17** 18 **19** 20 21 22 **23** 24 25 26 27
**03** 04 **05** 06 **07** 08 09 10 **11** 12 **13** **00** **00** 16 **17** 18 **19** 20 21 22 **23** 24 25 26 27 28 **29** 30 **31** 32
09 10 **11** 12 **13** 14 15 16 **17** 18 **19** **00** **00** 22 **23** 24 25 26 27 28 **29** 30 **31** 32 33 34 35 36 **37** 38
16 **17** 18 **19** 20 21 22 **23** 24 25 26 **00** **00** **29** 30 **31** 32 33 34 35 36 **37** 38 39 40 **41** 42 **43** 44 45
24 25 26 27 28 **29** 30 **31** 32 33 34 **00** **00** **37** 38 39 40 **41** 42 **43** 44 45 46 **47** 48 49 50 51 52 **53**
33 34 35 36 **37** 38 39 40 **41** 42 **43** **00** **00** 46 **47** 48 49 50 51 52 **53** 54 55 56 57 58 **59** 60 **61** 62
**43** 44 45 46 **47** 48 49 50 51 52 **53** **00** **00** 56 57 58 **59** 60 **61** 62 63 64 65 66 **67** 68 69 70 **71** 72

**Algorithm of one-color dotted plot of the natural prime numbers creation and arithmetical variant of the Riemann hypothesis proof in 2D system of Cartesian coordinates.**

Resume, we are needed to calculate all requested mathematical information for making one-color dotted plot using the natural prime numbers set, the scheme of which is shown above.

The natural prime numbers on the schematic diagram above are represented in view of the blue color ones. The complex-and-algebraic or pseudo prime numbers are shown in green color from the left side of it but on the total dotted natural and pseudo prime numbers plot they will be in the blue color. The red color zero numbers are representing all composite natural numbers, forming so called “the tunnel” or “corridor” and even “the null-tubing” inside of which **it is absent any natural prime number absolutely**. And it is the axiom ! Such an unusual rule and situation for prime numbers ! And such a wonderful a d d i t i o n to the Riemann hypothesis proof and his famous Zeta-function too !

On our schematic diagram above, as on the plot itself too (Fig. 16), is seen very good the parabolic curve, consisting of the double zeros, that serves as “the watershed” or the border between the natural numbers and their complex-and-algebraic equivalents. From the peak of the modern philosophical sciences, all space inside of this parabolic area is representing the Metaphysical World, the Time Machine, the fantastic zone of the ideal human life, Nirvana, the fourth measure, the 7-th sky, or, if using it for our problem decision, it is the area of pseudo or complex numbers.

Of course, the total dotted plot of the natural prime numbers is including the parabolic area too and thanks to it, our plot may be represented in view of four different variants, dependent on the parabolic area orientation. Let us convent mutually that the standard position of our total plot is as correct as our scheme above, i.e. the $\llcorner \varphi = \pi$ (“the eye” of parabola looks to the left).

To manage perfectly or even up to the professional level in technique of the prime number dotted plots creating, it has been worked out the universal system that has at least three sequent steps, which are as follows.

First of all, it is required to choose the paper format (A4) and the scale of our future plot. As a rule, it is created in M 1 : 25 i.e. one squire mm or $mm^2$ is the smallest cell for our plot. Besides this, the plot Creator must determine by all means the center of the format, mark it with red point to see it visually, and then make the “whatershed” or border between the natural numbers area and their antipodes --- the complex ones, having created the dotted parabola from the red points. The dot color choosing is an absolute prerogative of the plot Creator !

The next step is prime number parameters determining in so called Register or Module. It is very specific element or Metric information about each prime number of this Module on all levels and cells of the plot. With a help of the empiric formula $\{A_n\} = (a1) + [\, n\,(n - 1) / 2\,]$, one must determine the first most natural numbers on the all lines of this Module under the Instruction directed below. Here are given too some example of such calculations. For example, we are needed to determine the first number on the fourth line of the IV-quadrant:

$$(a1) = 1 \qquad n = 4 \qquad \{A_n\} = 1 + [\, 4\,(4 - 1) / 2\,] \qquad \{A_n\} = 1 + 6 \qquad \{A_n\} = 7$$

Resume, we are needed by all means to determine the first complex (negative) number situated on the second line inside of the parabolic area:

$(a1) = (-12) \qquad n = 2 \qquad \{A_n\}= (-12) + [\, 2\,(2 - 1) / 2\,] \qquad \{A_n\} = (-12) + 1 = 11 \qquad \{A_n) = ( - 11)$

Resume, you are needed, for example, to clarify the first natural --- composite or prime --- number on the 500,000 line of our future dotted plot and whether it will be the composite number from the left to it or no. Our method will decide this difficult task as easy as two by two:

$\{A_n\} = ?$ (a1) = 1 n = 500,000 $\{A_n) = 1 + [\ 500{,}000\ (\ 500{,}000 - 1) / 2\ ]$ $\{A_n\} = 124{,}999{,}750{,}001$.

Let us check out this natural number whether it prime or no by using the remarkable Russian web-Site www.aboutnumber.ru again. This our scientific assistant says to us that the calculated number is a composite one indeed ! And the nearest ones must be the same. But it is better to check out, if the 124,999,749,999 number is prime indeed or no. The same Site says to us again that our natural number is a composite too. And, it is means that our method works ideally!

Resume, we are needed to determine what the natural --- prime or composite --- number will be the first one on the 1,000,000 line of our future dotted plot.

$\{A_n\} = ?$ (a1)=1 n=1000000 $\{A_n\}=1+[1000000\ (\ 1000000 - 1) / 2\ ]$ $\{A_n\}= 499{,}999{,}500{,}001$.

Our natural number analyze whether it prime or no says to us that it is the composite one too ! But, let us check out the nearest to our calculated natural one --- the number 499,999,999,999. The answer is as usual as the previous ones --- it is the composite number too !

Resume, we are needed to determine what --- prime or composite --- number will appear on the 1,500,000 line of our future dotted plot and what will the next to it from the left of it:

$\{A_n\} = ?$ (a1)=1 n=1500000 $\{A_n\}=1+[1500000\ (\ 1500000 - 1) / 2]\{An\}=1{,}124{,}999{,}250{,}001$.

And again, we have the negative answer ! Our natural number is the composite one. But what is our closest number from the left --- the natural number 1,124,999,249,999 ? Inspect whether it has or no “a little blue strip on the little paw” ! And alas ! The answer is negative one as usual, to our big regret --- these natural numbers are both the composite ones !

Resume, we are needed to determine what number --- prime or composite --- will be the first one on the 2000000 line of our future dotted plot and will be they composite or no the nearest two natural numbers to the left from it.

$\{A_n\}= ?$ (a1)=1 n=2000000$\{A_n\}=1+[2000000\ (\ 2000000 - 1) / 2\ ]$ $\{A_n\}= 1{,}999{,}999{,}000{,}001$.

This natural number is a composite too, as its two nearest ones to the left. Let us determine the nearest prime number to our calculated composite number 1,999,999,000,001 to the right from it. And, here it is --- 1,999,999,000,007 !

As it is seen very well from these examples, represented here method of prime numbers coordinates calculation has demonstrated itself from the best side indeed and allows to us to decide a wide circle of the unusual mathematical tasks. The method written above is the first stage to manage perfectly both theory& practice in creation of dotted plots in the 2D-coordinates.

Our next step in the complicated process of creating the prime number plots is calculating mathematically all prime numbers coordinates in I-II-III-IV quadrants of our future dotted plot.
.
The worked out methodology or the Theory of Intervals simplifies much enough and perfect this problem decision ! Below, one can see naturally and clearly very much some pasted patterns or examples of how this Theory of Intervals works in principal and generally too.

. **Module ( + 1): OX [ ( + 1 ) ÷ ( + 50 ) ]; OY [ ( ± 1 ) ÷ ( ± 100 ) ] (+1) Module**

**1. ………………………………………………………………………………**
**2. ………………………………………………………………………………**
**3. ………………………………………………………………………………**
**-**
**-**
**21. 311 - 360 9 [ 0 - 311 ÷ 359 - 1 ]**

**311-313-317-331-337-347-349-353-359**
**0 1 3 13 5 9 1 3 5. (+1)Module**

**Module ( + 5): OX [ ( +201) ÷ ( + 250 ) ]; OY [ ( ± 1 ) ÷ ( ± 200 ) ] (+5) Module**

**1 ………………………………………………………………………………**
**2. ……………………………………………………………………**
**3. ……………………………………………………………………..**
**-**
**-**
**-**
**45. 1.191 - 1.240 8 [ 2 - 1.193 ÷ 1.237 - 3 ]**

**1.193-1.201-1.213-1.217-1.223-1.229-1.231-1.237**
**2 7 11 3 5 5 1 5. (+5) Module**

**Module (+1): OX [ (+1)÷( + 1000) ];OY [ ( ± 1.414.001)÷( ± 1.414.220) ] (+1) Module**

**1. ……………………………………………………………………….**
**2. ……………..…………………………………………………………**
**3. ……………………………………………………………………..**
**-**
**-**
**-**

**1.414.001. 999.698.707.001 - 999.698.708.000 38 [ 42 -7.043 ÷ 7.951 - 49 ]**

**7.043-7.057-7.067-7.081-7.109-7.123-7.129-7.153-7.169-7.201-7.213-7.261-7.283-7.313-7.331-**
**42 13 9 13 27 13 5 23 15 31 11 47 21 29 17**
**7.373-7.387-7.421-7.429-7.459-7.507-7.517-7.591-7.603-7.619-7.691-7.797-7.717-7.727-7.753-**
**41 13 33 7 29 47 9 73 11 15 71 5 19 9 25**
**7.771-7.859-7.867-7.901-7.919-7.921-7.939-7.951**
**17 87 7 33 17 1 17 11. (+1) Module**

**Table of natural prime numbers from 2 up to 6343 ( 824 pcs. )**
2-3-5-7

11-13-17-19-23-29-31-37-41-43-47-53-59-61-67-71-73-79-83-89-97

101-103-107-109-113-127-131-137-139-149-151-157-163-167-173-179-181-191-193-197-199-
211-223-227-229-233-239-241-251-257-263-269-271-177-281-283-293-307-311-313-317-331-
337-347-349-353-359-367-373-379-383-389-397-401-409-419-421-431-433-439-443-449-457-
461-463-467-479-487-491-499-503-509-521-523-541-547-557-563-569-571-577-587-593-599-
601-607-613-617-619-631-641-643-647-653-659-661-673-677-683-691-701-709-719-727-733-
739-743-751-757-761-769-773-787-797-809-811-821-823-827-829-839-853-857-859-863-877-
881-883-887-903-911-919-929-937-941-947-953-967-971-977-983-991-997

1009-1013-1019-1021-1031-1033-1039-1049-1051-1061-1063-1069-1087-1091-1093-1097-
1103-1109-1117-1123-1129-1151-1153-1163-1171-1181-1187-1193-1201-1213-1217-1223-
1229-1231-1237-1249-1259-1277-1279-1283-1289-1291-1297-1301-1303-1307-1319-1321-
1327-1361-1367-1373-1381-1399-1409-1423-1427-1429-1433-1439-1447-1451-1453-1459-
1471-1481-1483-1487-1489-1493-1499-1511-1523-1531-1543-1549-1553-1559-1567-1571-
1579-1583-1597-1601-1607-1609-1613-1619-1621-1627-1637-1657-1663-1667-1669-1693-
1697-1699-1709-1721-1723-1733-1741-1747-1753-1759-1777-1783-1787-1789-1801-1811-
1823-1831-1847-1861-1867-1871-1873-1877-1879-1889-1901-1907-1913-1931-1933-1949-
1951-1973-1979-1987-1993-1997-1999-2003-2011-2017-2027-2029-2039-2053-2063-2069-
2081-2083-2087-2089-2099-2111-2113-2129-2131-2137-2141-2143-2153-2161-2179-2203-
2207-2213-2221-2237-2239-2243-2251-2267-2269-2273-2281-2287-2293-2297-2309-2311-
2333-2339-2341-2347-2351-2357-2371-2377-2381-2383-2389-2393-2399-2411-2417-2423-
2437-2441-2447-2459-2467-2473-2477-2503-2521-2531-2539-2543-2549-2551-2557-2579-
2591-2593-2609-2617-2621-2633-2647-2657-2659-2663-2671-2677-2683-2687-2689-2693-
2699-2707-2711-2713-2719-2729-2731-2741-2749-2753-2767-2777-2789-2791-2797-2801-
2803-2819-2833-2837-2843-2851-2857-2861-2879-2887-2897-2903-2909-2917-2927-2939-
2953-2957-2963-2969-2971-2999-3001-3011-3019-3023-3037-3041-3049-3061-3067-3079-
3083-3089-3109-3119-3121-3137-3163-3167-3169-3181-3187-3191-3203-3209-3217-3221-
3229-3251-3253-3257-3259-3271-3299-3301-3307-3313-3319-3323-3329-3331-3343-3347-
3359-3361-3371-3373-3389-3391-3407-3413-3433-3449-3457-3461-3463-3467-3469-3491-
3499-3511-3517-3527-3529-3533-3539-3541-3547-3557-3559-3571-3581-3583-3593-3607-
3613-3617-3623-3631-3637-3643-3659-3671-3673-3677-3691-3697-3701-3709-3719-3727-
3733-3739-3761-3767-3769-3779-3793-3797-3803-3821-3823-3833-3847-3851-3853-3863-
3877-3881-3889-3907-3911-3917-3919-3923-3929-3931-3943-3947-3967-3989-4001-4003-
4007-4013-4019-4021-4027-4049-4051-4057-4073-4079-4091-4093-4099-4111-4127-4129-
4133-4139-4153-4157-4159-4177-4201-4211-4217-4219-4229-4231-4241-4243-4253-4259-
4261-4271-4273-4283-4289-4297-4327-4337-4339-4349-4357-4363-4373-4391-4397-4409-
4421-4423-4441-4447-4451-4457-4463-4481-4483-4493-4507-4513-4517-4519-4523-4547-
4549-4561-4567-4583-4591-4597-4603-4621-4637-4639-4643-4649-4651-4657-4663-4673-
4679-4691-4703-4721-4723-4729-4733-4751-4759-4783-4787-4789-4793-4799-4801-4813-
4817-4831-4861-4871-4877-4889-4903-4909-4919-4931-4933-4937-4943-4951-4957-4967-
4969-4973-4987-4993-5003-5009-5011-5021-5023-5039-5051-5059-5077-5081-5087-5099-
5101-5107-5113-5119-5147-5153-5167-5171-5179-5189-5197-5209-5227-5231-5233-5237-
5261-5273-5279-5281-5297-5303-5309-5323-5333-5347-5351-5387-5393-5399-5407-5413-
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6229-6247-6257-6263-6269-6271-6277-6287-6299-6301-6311-6317-6323-6329-6337-6343-

**Table of natural prime numbers from 2 up to 13171( 1.549 чисел ).**

1-2-3-5-7

11-13-17-19-23-29-31-37-41-43-47-53-59-61-67-71-73-79-83-89-97

101-103-107-109-113-127-131-137-139-149-151-157-163-167-173-179-181-191-193-197-199-
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1229-1231-1237-1249-1259-1277-1279-1283-1289-1291-1297-1301-1303-1307-1319-1321-
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2437-2441-2447-2459-2467-2473-2477-2503 2521-2531-2539-2543-2549-2551-2557-2579-
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11987-12007-12011-12037-12041-12043-12049-12071-12073-12097-12101-12107-12109-
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12953-12959-12967-12973-12979-12983-13001-13003-13007-13009-13033-13037-13043-
13049-13063-13093-13099-13103-13109-13121-13127-13147-13151-13159-13163-13171.

And, being finishing our story, let us represent the algorithm or empiric formulas for determining any but the prime number(s) firstly, if we are known its xy-Cartesian coordinates:

$P - 1 = 0.5 y^2 + x - 0.625$ --- for any numbers in I - IV quadrants;

$N + 1 = - ( 0.5 y^2 + x + 0.375 )$ --- for any numbers that are inside of the narrow parabolic area of II & III quadrants only.

Resume, we are needed to determine the natural prime number, if its dotted equivalent, situated in IV quadrant of our plot, has the following xy-coordinates: A (0,5; - 1,5)

$0,5 = - 0,5*2,25 + P + 0,625 \quad P = 1 + 0,5 + 1,125 - 0,625 \quad P = 2$

On the Russian Web-site ( URL: www.aboutnumber.ru ), one can find the biggest prime number P = 99,999,999,999,973. Let us we try to calculate the line number of our dotted plot, on which this natural prime number will be situated. By other words, we must calculate the unknown integer (n) in our empiric formula $\{A_n\} = (a1) + [ n (n - 1) / 2 ]$:

$99,999,999,999,973 = 1 + [ n ( n - 1 ) / 2 ]$

$199,999,999,999,946 = 2 + n^2 - n \qquad n^2 - n - 199999999999944 = 0$

$n = 0,5 \pm \sqrt{199999999999944,25} \qquad n = 0,5 \pm 14.142.135, 5 \qquad n = 14.142.136$

By other words, the last natural prime number from the Table of Prime numbers is situated as far as the 14,142,136 line is on our dotted-one-color plot of the natural prime numbers along the ± OY axe, and at the distance of 1,749,793 cells to the right along the OX+ axe. from the zero point. Let us check out the correctness of our calculations:

$P = \{A_n\} = 99,999,999,999,973 \quad (a1) = 1,749,793 \quad n = 14,142,136 \quad \{A_n\}= (a1) + [ n ( n - 1 ) / 2 ]$

$P = \{A_n\} = 1,749,793 + 7,071,068*14,142,135 \qquad \{A_n\}= 99,999,998,250,181 + 1,749,792$

$P = \{A_n\} = 99,999,999,999,973$ !

And, at last, let us determine the formulas of our natural number sequences from the “zero-tubing”, using the Niel Sloane Encyclopedia of the Natural number sequences: :

L ÷ (0, 2, 5,) 9, 14, 20, 27, 35, 44, 54, 65,… R ÷ (0, 1, 3,) 6, 10, 15, 21, 28, 36, 45, 55,…

$\{A_n\} = n ( n + 1) / 2 \qquad\qquad \{A_n\} = n (n + 3) / 2$

**Thoughts of the Great people**

The Great Lord always applies the rules of Geometry. Archimedes

Everyting is a number ! Pythagor

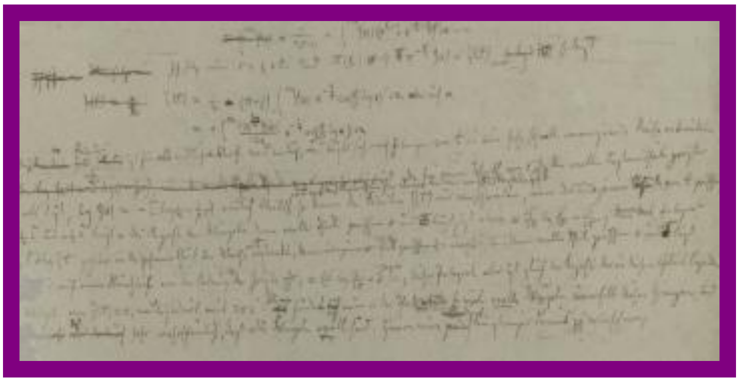
There are more things in heaven and earth, Horatio,

Than thy philosophy ever dreamed of.

William Shakespeare. “HAMLET”.

**Some mathematical illustrations made by the famous mathematicians to proof the Riemann hypothesis**

# Riemann Hypothesis



**Some numbers have the special property that they cannot be expressed as the product of two smaller numbers, e.g., 2, 3, 5, 7, etc. Such numbers are called *prime* numbers, and they play an important role, both in pure mathematics and its applications. The distribution of such prime numbers among all natural numbers does not follow any regular pattern. However, the German mathematician G.F.B. Riemann (1826 - 1866) observed that the frequency of prime numbers is very closely related to the behavior of an elaborate function**

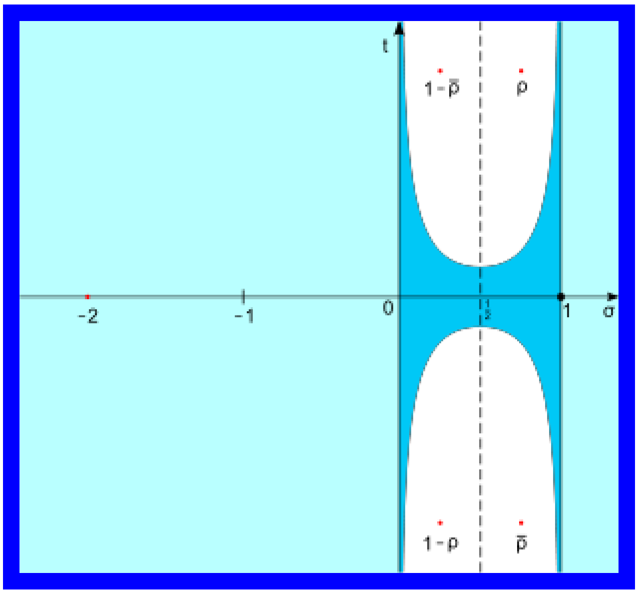
$$\zeta(s) = 1 + 1/2^s + 1/3^s + 1/4^s + \ldots$$

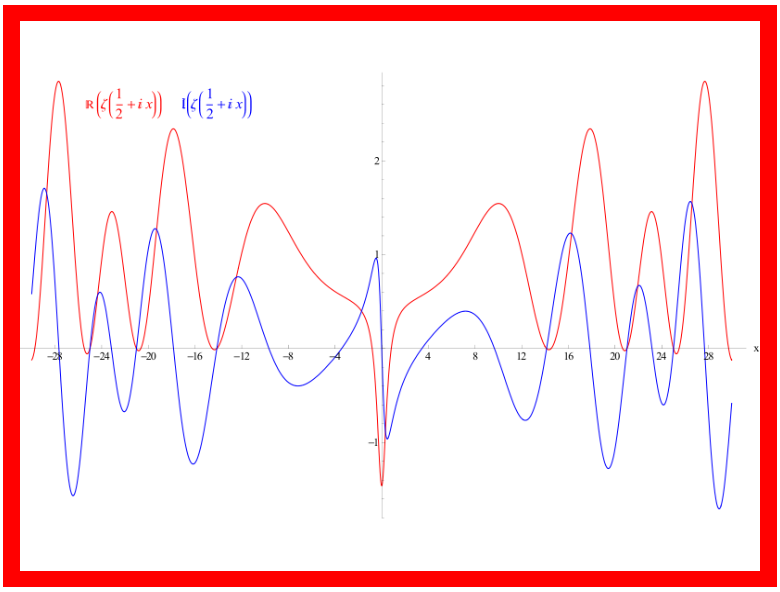
**called the *Riemann Zeta function*.**

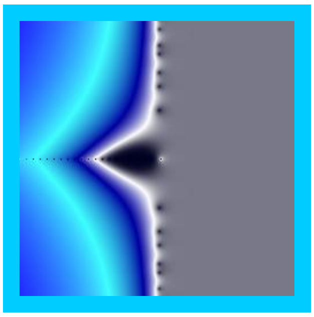
**The Riemann hypothesis asserts that all *interesting* solutions of the equation $\zeta(s) = 0$ lie on a certain vertical straight line.**

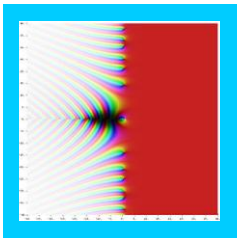
**This has been checked for the first 10,000,000,000,000 solutions. A proof that it is true for every interesting solution would shed light on many of the mysteries surrounding the distribution of prime numbers.**

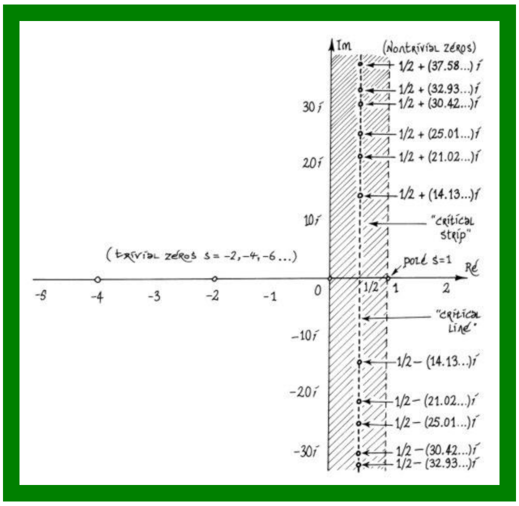
**This problem is:**
**Unsolved**

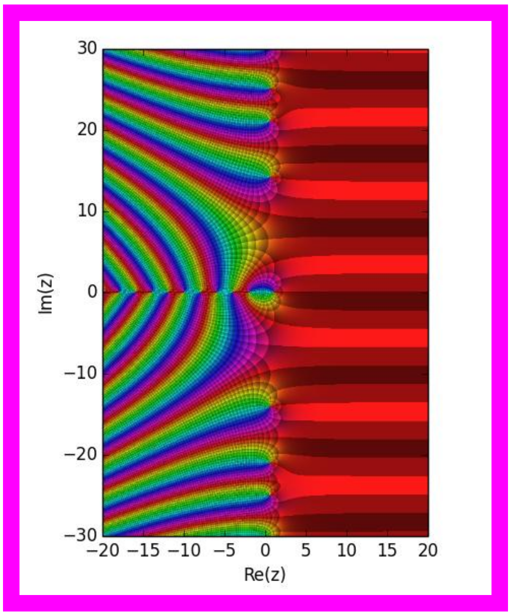

t
1 - ρ̄
ρ̄
0
1
σ
-2
-1
1 - ρ
ρ̄

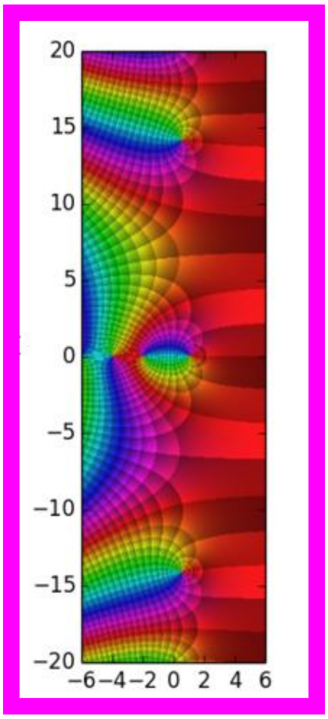

$\mathrm{R}\left(\zeta\left(\frac{1}{2}+ix\right)\right)$
$\mathrm{I}\left(\zeta\left(\frac{1}{2}+ix\right)\right)$
x

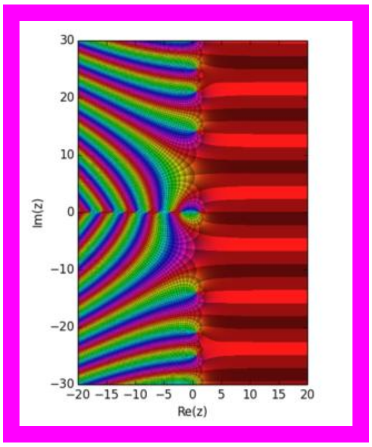


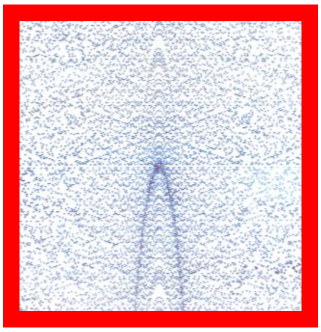




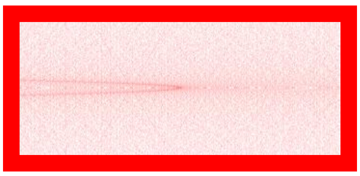



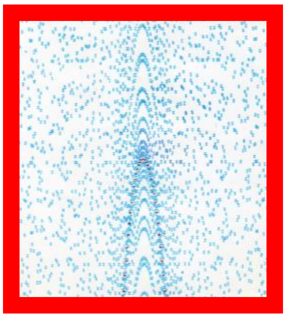


**i**



**ii**



**iii**

**Three small versions of prime number dotted plots (i-ii-iii) made by Author.**

**Conclussion..**

Represented here in this article a new scientific method of graphical visualization of the natural numbers and consequences, forming by them, in view of chains of the colored dotes and sets in 2D Cartesian coordinates became possible, when the Author of this article salved the nonstandard mathematical task, having united the “Ulam’s spieral” and own invention with the rectangular system of Cartesian coordinates. The bright and very impressive illustrations were appearing in a result, as if some one has correctly distributed the confetti on the surface of the magic field, and even their Inventor himself was surprised very much observe his “drawings”. Looking at my graphs and plots, the thought was born that no one in the World can create such “pictures” but Mr. Benoit B. Mandelbrot, the famous American mathematician, that used in his mathematical creativity the complex numbers, his own fantasy and the simplest IBC PC programmable media products as well. The results of Mandelbrot’s work are known to everybody, but the plots made by me are known to nobody, to my big regret.

Many centuries ago, the French scientist R. Descartes has invented the method of representation the suited information in view of mathematical lines, curves and the schematic diagrams in a symbol net, where two lines were crossing under the angle of 90º forming a zero-point as the beginning of this system. But the most interesting illustrations in this system, named letter in honor of R. Descartes, were appearing when the mathematicians dissolved graphically the equations and different functional dependences like $y = x^2$, $y = x^3$ and a lot of others. Now, almost four century later from the invention of Cartesian coordinates system, this great idea of the French academician has become the first media in many sciences for decision of different mathematical tasks, that can now decide any educated person from the school pupils and ending the Nobel Prize laureates.

When the first natural numbers plots were crated by me in the Cartesian coordinates, it has been noticed that the investigated idea has relation not only to a method of studying the natural numbers and their complex-algebraic equivalents but, how strange it may be, to the mathematical or Cartesian plus-minus infinity, the perfect theory of its studying and representing is worked by no one scientists up to this day. The graphic-and analytic method of visualization of natural numbers presented in this article opens widely the doors and gates for all and any persons, who will introduce with the main principles of this idea. And everything that it is needed for this work --- the elementary interest to this new idea in mathematics. Thanks to this method, one can make in the rectangular system of Cartesian coordinates some beautiful color dotted “photo portrait” of any natural number, for example, 1, 2, 3, 5, 17. 35 etc., or the “picture” any, formed from them, consequence, such ones as the prime numbers, twin-numbers, Fibonacci numbers and etc.

In this article, special attention is paid to the specific rules and methods of calculation and creating the prime numbers graphs and other plots in Cartesian coordinates, having provided them preliminarily with a mathematical tables, where are listed all necessary information to create with their help the main mathematical “photos” of these consequences in the rectangular system of Cartesian coordinates. The method allows to make the same illustrations in axonometric projection when the three axis are under the angle of 120º to one another. It is also existing the method of programming the Cartesian system with the help of the correspondence basic modules-stencils that can create the initial variant of the future colored - dotted mathematical illustrations that will allow to convert this idea into the huge interminable scientific kaleidoscope or mathematical casket with dozens of drawings and illustrations for further professional studying the natural numbers, their complex-algebraic equivalents themselves, and their 1-,2-,3- and many colored dotted graphics, created by hand or by PC programmable facilities under the guidance of the skilled mathematicians as well.

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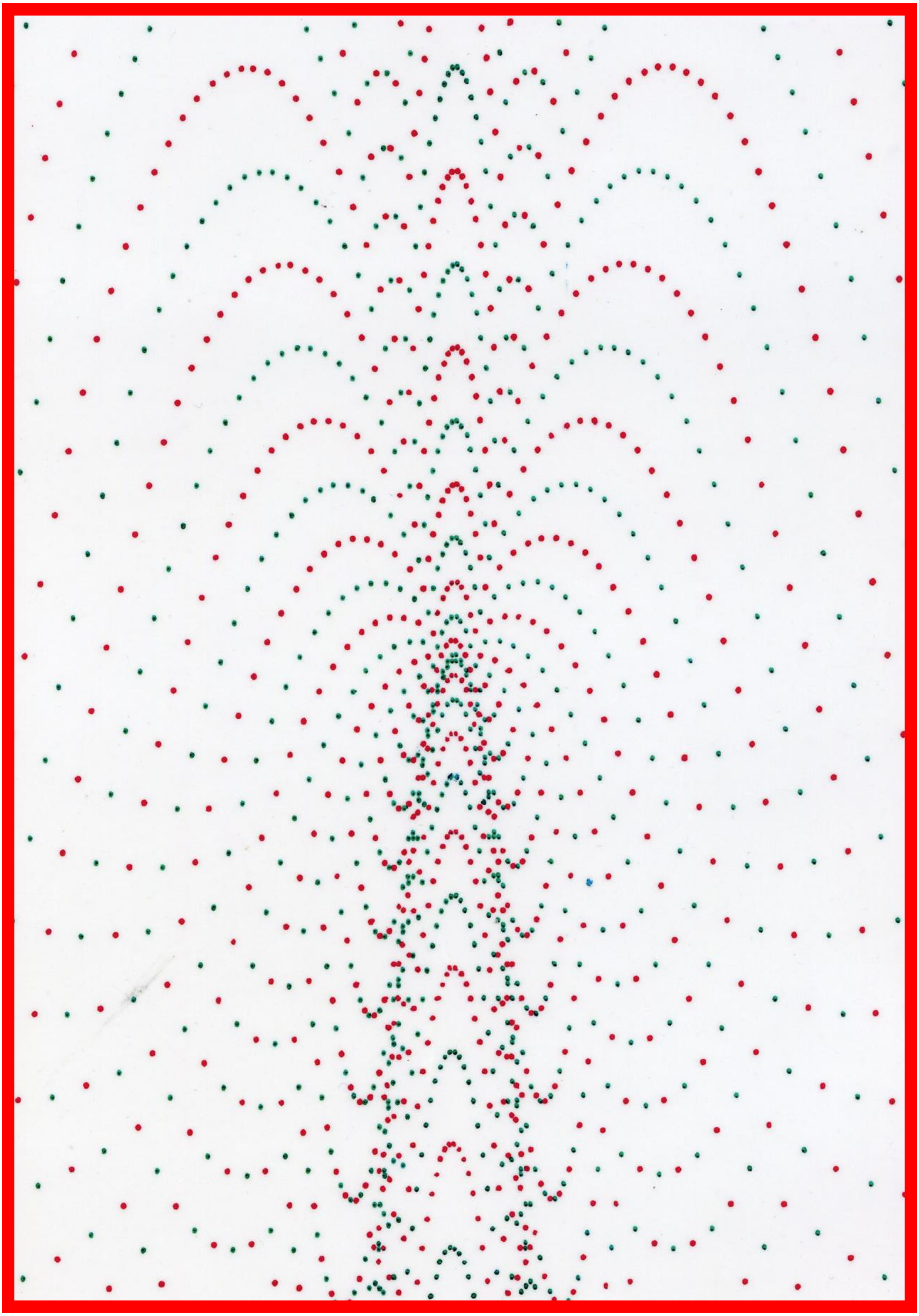

**Fig. 14 The interminable red-green dotted plot of the quadratic $\{A_n\}=\{n^2\}$ consequence**

**of the natural numbers in the rectangular system of Cartesian (±) coordinates.**

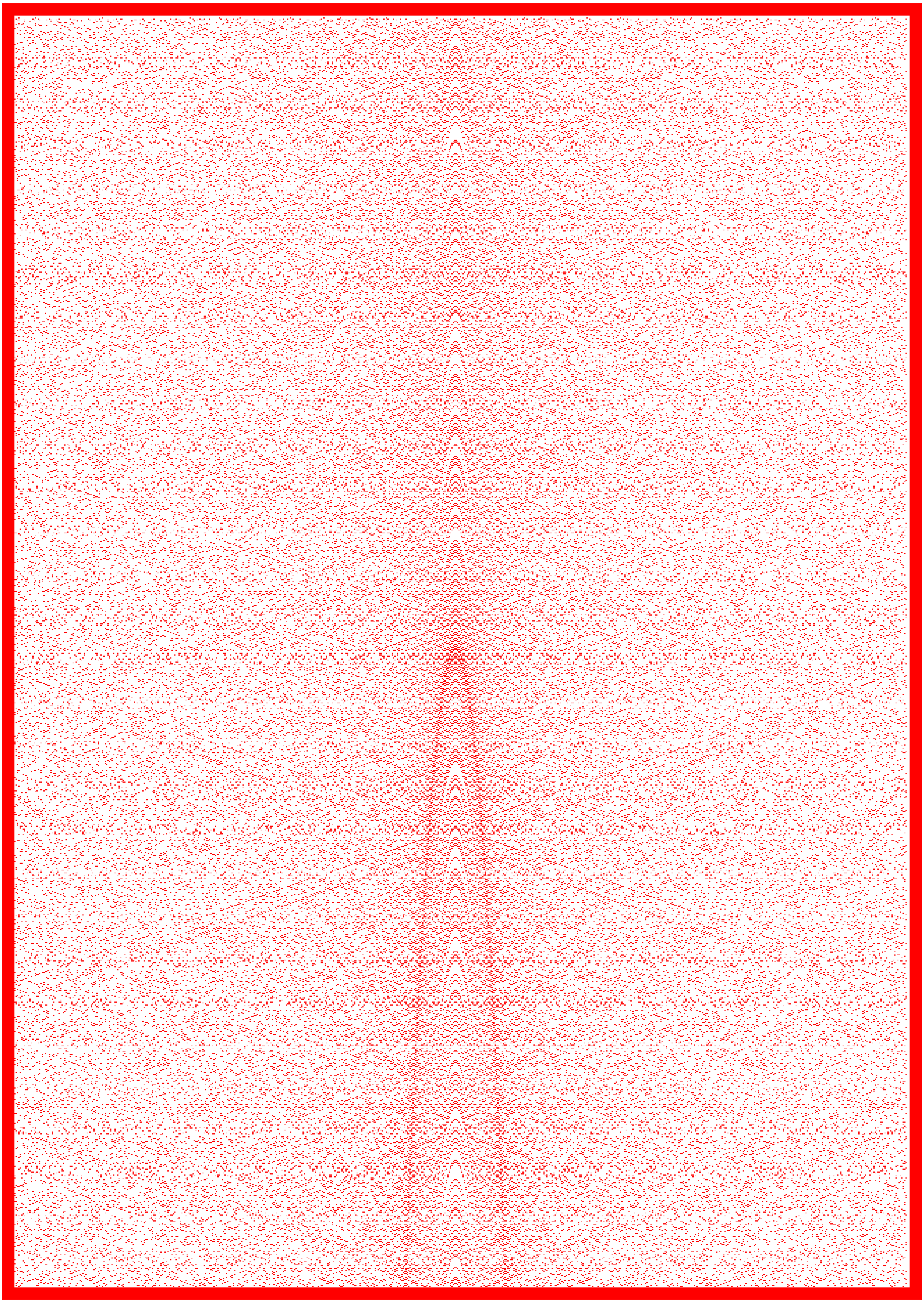

**Fig. 15 $\{A_n\} = \{\pi_n\}$ (in C++) or the Prime numbers plot in the rectangular System of Cartesian (±) coordinates**

**(fragment)**

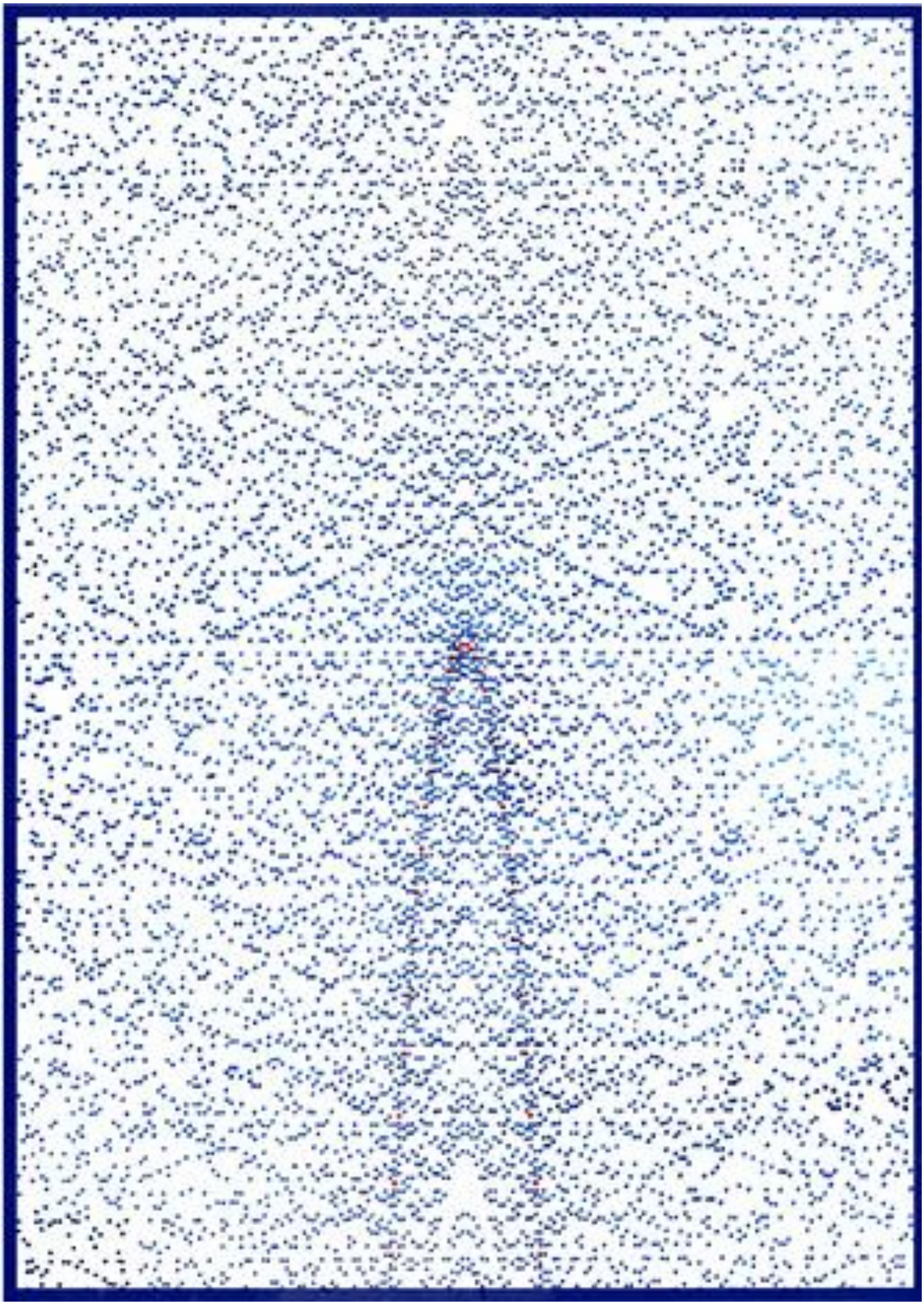

**Fig 16. $\{A_n\} = \{\pi_n\}$ Prime numbers dotted plot as the Riemann's hypothesis confirmation. (hand-made).**

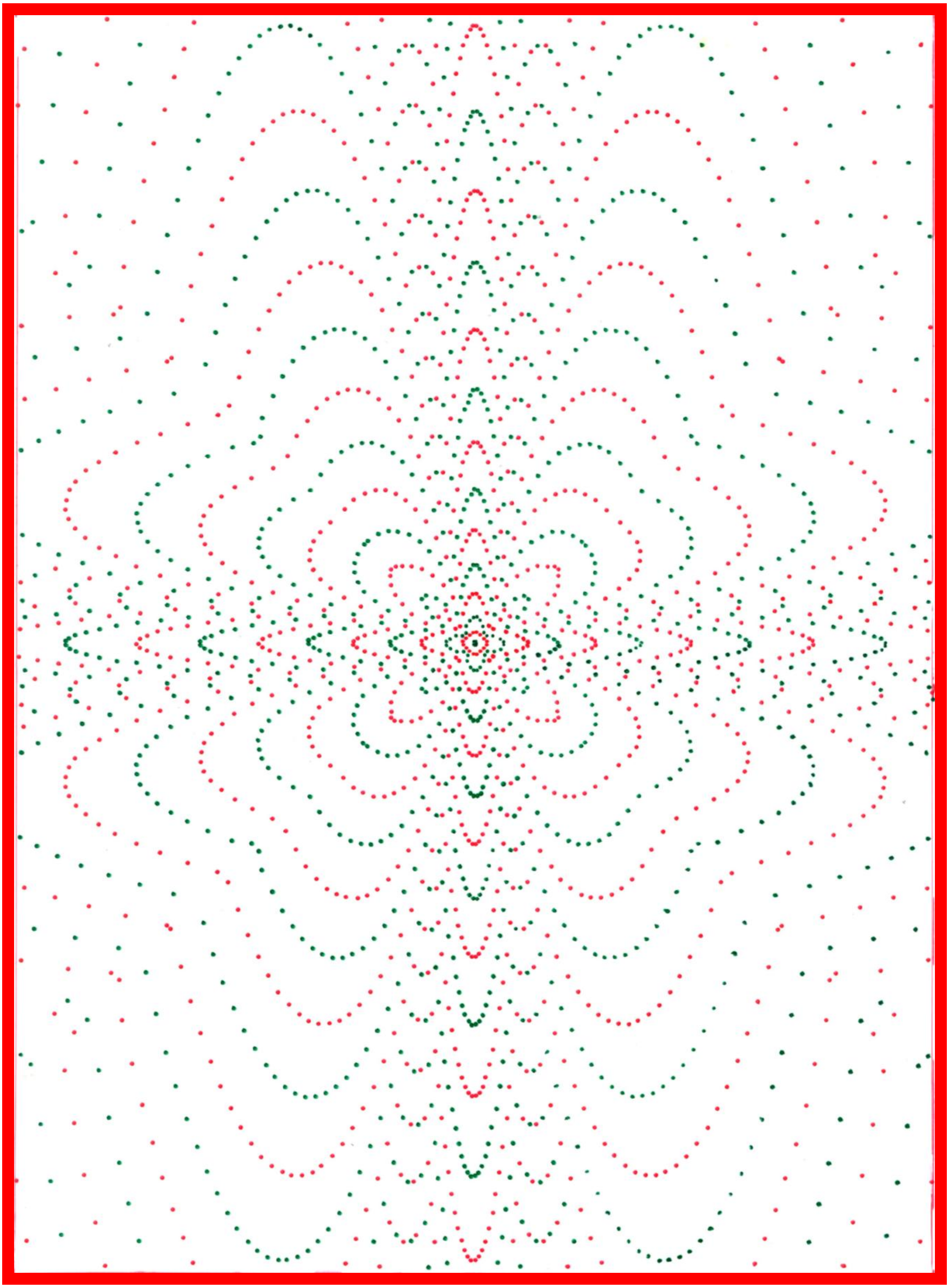

**Fig. 17   Big Bang or the gravitational waves after merging of four Black Holes (Ideal mathematical model-plot of the famous idea predicted by A.Einstein).**