Riemann's Hypothesis and Non-modular elliptic curves

(System algorithms and geometrical interpretation)

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Abstract

Existence of non-modular elliptic curves, the new interpretation of G. Frey's equation for elliptic curves and the secondary reduced forms of numbers theory of H.Poincare, as key to decision about common problem of Fermat's Last Theorem and Riemann's Hypothesis, are described in this article.

General introduction.

"Some mathematicians are not satisfied with the method of the proof using elliptic curves and modular forms which are considered (probably, unfairly? or it is fair?) as alien to this problem. The task is quite reasonable to try to find another, more simple, proof of Fermat's Last Theorem "
P.Ribenboim, Fermat's Last Theorem for Amateurs, part XI.2
1999, Springer-Verlag.

This article contains:

1) A description of the mistake by Wiles A. in his proof of Fermat's Last Theorem . Essence of a mistake – is a wrong hypothesis Shimura-Taniyama , asserting modular of all elliptic curves. There is an infinite set of non-modular elliptic curves, that is shown in applied article.

2) Three rule (Rule A, Rule B, Rule C) for calculation of infinite set of prime numbers, as development rule of Germain S. $q-1=2kp$ **divide** $2ks$ **if p|s and** $p \equiv a^{p} \pmod{q}$**, where** $a \equiv h^{s/p} \pmod{q}$**, and as basis to proof Riemann's Hypothesis. It is confirmation for heuristic conclusion** $\mathrm{Lim}_{N\to\infty} Q(N)=\infty$ **if** $Q(N) \approx C(f_1,\dots,f_n)\dfrac{1}{\log f_1(n)\dots\log f_k(n)} \neq 0$ **for endless series prime numbers** $f_1(n), f_2(n), \dots, f_k(n)$**,**
where $k \to \infty$ **, see [1].**

3) Synthesis equation elliptic curve of G.Frey, equation of Fermat P. and of Beal A. , secondary reduced forms of the theory numbers of Poincare H. , simple formulas for calculation of infinite set prime numbers.

Special introduction

According to Gedel's theorem [1] of imperfection, any mathematical proof can't be final. So, proof by Wiles is not final too. Moreover, it is based on the controversial hypothesis of Shimura-Taniyama [2]. According to that – proof made by Wiles [3] is controversial result. Any where Kouts (the head of Wiles) decided that Wiles should have occupied himself with that sphere of mathematics which is called as theory of elliptical curves. As afterwards turned out this equation became of turning point in fate of Wiles and armed him with the methods which were necessary for developing a new approach to the proof of the Great theorem of Fermat. Name of "elliptical curves" can mislead you because they are not ellipses and even not curves as we understand this word. The talk is about equation of the type

$$y^2 = x^3 + a \cdot x^2 + b \cdot x + c \qquad (1)$$

where a, b, c are some numbers.

Its name elliptical curves got because some functions closely connected with these curves were needed for measurements of lengths of ellipses (so therefore lengths of planetary orbits). Equations of this type are called cubical. The problem of elliptical curves, as a problem proof of Great theorem of Fermat is in the question , if there are any corresponding whole number solutions, and if there how many. For instance cubical equation :

$$y^2 = x^3 - 2 \qquad (2)$$

If cubic (1) contains:

$$a = 0\ ,\ b = 0\ ,\ c = -2 \qquad (3)$$

has only one solution in whole numbers as follows:

$$5^2 = 3^3 - 2 \quad \text{or} \quad 25 = 27 - 2 \qquad (4)$$

It is common knowledge, to proof that this equation has only one solution in whole numbers is a difficult task. This fact was proved by Pierre Fermat. Number 26 — is the only number in the Universe, places between square and cube. Fermat also proved that. His solution is equivalent to proof that given above cubical equation has only one solution in whole numbers, which is 5^2 and 3^3 — are the only square and cube, difference of which is 2, so 26 — is the only whole number which can be places between square and cube. But I doubted these "truth" and here are definite results in form of solutions of cubical equations, which contain cubes and squares of whole numbers. There can be infinite unique quantity of such:

Equation № 1

$$z^2 = y^3 + x^2 \qquad (5)$$

where:

$$z = 2187\ ,\ y = 162\ ,\ x = 729 \qquad (6)$$

Examination:

$$[2187^2 = 4\,782\,969] = [162^3 = 4\,251\,528] + [729^2 = 531\,441] \quad (7)$$

In the result we come to conclusion that, there number 531 441 between square and cube « the only one in the Universe» ?

Because equality:

$$2\,187^2 = 531\,441 + 162^3 \quad (8)$$

Equation № 2

$$z_2{}^2 = y_2{}^3 + x_2{}^2 \quad (9)$$

where:

$$z_2 = 1.8\,248\,004 \cdot 10^{36}, \; y_2 = 1.435\,796 \cdot 10^{24}, \; x_2 = 6.0\,826\,679 \cdot 10^{35} \quad (10)$$

Examination

$$[(1.8248004 \cdot 10^{36})^2 = 3.3\,298\,965 \cdot 10^{72}] = \\ = [(1.435796 \cdot 10^{24})^3 = 2.959\,908 \cdot 10^{72}] + [6.0826679 \cdot 10^{35})^2 = 3.6\,998\,849 \cdot 10^{71}] \quad (11)$$

In the result we come to conclusion that, there number $3.6\,998\,849 \cdot 10^{71}$ between square and cube « the only one in the Universe» ?

Because equality:

$$[1.8\,248\,004 \cdot 10^{36}]^2 = 3.6\,998\,849 \cdot 10^{71} + [1.435\,796 \cdot 10^{24}]^3 \quad (12)$$

General comments for equality (8) and (12) :

Begin comments.

Ccomment for equality (8).

$$2\,187^2 = 531\,441 + 162^3$$

This equality contains two mathematical assertions:

1) **Square is equivalent for cube plus square:**

$$z_1{}^2 = y_1{}^3 + x_1{}^2$$

2) **Difference of two square is equivalent of cube:**

$$z_1{}^2 - x_1{}^2 = y_1{}^3$$

Let common initial data for assertions:

$$z_1 = 2187$$
$$y_1 = 162$$
$$x_1 = 729$$

Examination assertion (1):

$$2187^2 = 162^3 + 729^2 \text{ as equivalent } 4782969 = 4\,251\,528 + 531\,441$$

Examination assertion (2):

$$2187^2 - 729^2 = 162^3 \text{ as equivalent } 4782969 - 531441 = 4251528$$

Consequently

If special substitutions:

$$(X_1 - A_1) = x_1^2$$
$$X_1 = y_1^3$$
$$(X_1 + B_1) = z_1^2$$

for Frey's equation:

$$Y^2 = (X_1 - A_1) \cdot X_1 \cdot (X_1 + B_1)$$

then

$$A_1 = y_1^3 - x_1^2 = 3\,720\,087 \text{ whole number}$$
$$B_1 = z_1^2 - y_1^3 = 531441 = (27 \cdot 3)^3$$ **whole number and number 27 is discriminant's component**
$$\Delta = -\left(4a^3 + \frac{27}{b^2}\right)$$ **of canonical equation** $y^2 = x^3 + ax = b$ **elliptic curves**

Result : ratio $\frac{A_1}{B_1} = \frac{3720087}{(27 \cdot 3)^3} = 7$ **is prime number. It is equivalent a spectrum-invariant**

$7 = \frac{R^*}{\xi^*(7)}$ **for general solution of Riemann's Hypothesis, see (183).**

Comment for equality (12) :

$$[1.8248004 \cdot 10^{36}]^2 = 3.6998849 \cdot 10^{71} + [1.435796 \cdot 10^{24}]^3$$

This equality contains two mathematical assertions:

1) Square is equivalent for cube plus square:

$$z_2{}^2 = y_2{}^3 + x_2{}^2$$

2) Difference of two square is equivalent of cube:

$$z_2{}^2 - x_2{}^2 = y_2{}^3$$

Initial data for examination of assertions:

$$z_2 = 1.8248004 \cdot 10^{36}$$
$$y_2 = 1.435796 \cdot 10^{24}$$
$$x_2 = 6.0826679 \cdot 10^{35}$$

1) Examination of first assertion

Equality $\left(1.8248004 \cdot 10^{36}\right)^2 = \left(1.435796 \cdot 10^{24}\right)^3 + \left(6.0826679 \cdot 10^{35}\right)^2$

is equivalent for $3.3298965 \cdot 10^{72} = 2.959908 \cdot 10^{72} + 3.6998849 \cdot 10^{71}$

2) Examination of second assertion

Equality $\left(1.8248004 \cdot 10^{36}\right)^2 - \left(6.0826679 \cdot 10^{35}\right)^2 = \left(1.435796 \cdot 10^{24}\right)^3$

is equivalent for $3.3298965 \cdot 10^{72} - 3.6998849 \cdot 10^{71} = 2.959908 \cdot 10^{72}$

Consequently

If let substitutions:

$$\left(X_2 - A_2\right) = x_2{}^2$$
$$X_2 = y_2{}^3$$
$$\left(X_2 + B_2\right) = z_2{}^2$$

for of Frey's equation:

$$Y_2^{\,2} = (X_2 - A_2)\cdot X_2 \cdot (X_2 + B_2)$$

then $A_2 = y_2^{\,3} - x_2^{\,2} = 2.5899195 \cdot 10^{72}$ **whole number and**
$B_2 = z_2^{\,2} - y_2^{\,3} = \left(3.699885 \cdot 10^{27}\right)^3 = 3.699885 \cdot 10^{71}$ **whole number and number 27 is**
discriminant's component $\Delta = -\left(4a^3 + \frac{27}{b^2}\right)$ **of canonical form** $y^2 = x^3 + ax = b$ **elliptic curves**

Result : ratio $\frac{A_2}{B_2} = \frac{2.5899195 \cdot 10^{72}}{3.699885 \cdot 10^{71}} = 7$ **is prime number. It is equivalent a spectrum-invariant** $7 = \frac{R^*}{\xi^*(7)}$ **for general solution of Riemann's Hypothesis, see (183).**

End general comments

Short survey about solutions of Fermat's problem

Proof [7] of the Great theorem of Fermat, results of which were used in the attached article, lets make (construct) infinite number of such cubic. Proof of Wiles doesn't have this opportunity for the simple reason:

In the basis of Wiles lies false hypothesis of Shimura-Taniyama [2], [3] , [4], [5]:

All elliptical curves are modular

I make on the basis of Frey's equation infinite number of

Non –modular elliptical curves

For this reason I can construct infinite number of cubical equations, solved in whole numbers.

Exist two the way work out a problem of P.Fermat:

1.Deductive (intuitive) way

2.Inductive way

1. Deductive way

Let $x^8 + y^8 = z^8$ **equation of P. Fermat** **(13)**

A priori it is known:

$$\left.\begin{aligned} x &= 3.967133355... \\ y &= 4.262962429... \\ z &= 4{,}507533969... \end{aligned}\right\} \qquad (14)$$

Issue:

How did I do it?

Answer: Enigma

2. Inductive way

Let $x^n = A$, $y^n = B$, $z^n = C$ **whole or rational numbers.** **(15)**

Then:

$$\left.\begin{aligned} x &= \sqrt[n]{A} \\ y &= \sqrt[n]{B} \\ z &= \sqrt[n]{C} \end{aligned}\right\} \qquad (16)$$

roots for equation of P.Fermat:

$$x^n + y^n = z^n \qquad (17)$$

If

$$A + B = C \qquad (18)$$

where vectors

$$\left.\begin{aligned} A &= a_o^2 \cdot D_n = a_o^2 \cdot (a_o^{n-2} + b_o^{n-2} + c_o^{n-2}) \\ B &= b_o^2 \cdot D_b = b_o^2 \cdot (a^{n-2} + b_o^{n-2} + c_o^{n-2}) \\ C &= c_o^2 \cdot D_N = c_o^2 \cdot (a_o^{n-2} + b_o^{n-2} + c_o^{n-2}) \end{aligned}\right\} \qquad (19)$$

composed of primitive Pythagorean triplets.

$$\left.\begin{aligned} a_o &= v^2 - u^2 \\ b_o &= 2 \cdot v \cdot u \\ c_o &= v^2 + u^2 \end{aligned}\right\} \qquad (20)$$

Basis for Inductive way is Abelian group of three whole numbers:

$$\left.\begin{aligned} &\text{squares } a_o^2 \equiv a \quad \text{or vectors } A \equiv a \\ &\text{squares } b_o^2 \equiv b \quad \text{or vectors } B \equiv b \\ &\text{squares } c_o^2 \equiv c \quad \text{or vectors } C \equiv c \end{aligned}\right\} \qquad (21)$$

Here we have Abelian group of whole numbers a,b,c ower field $\left(a_o{}^2, b_o{}^2, c_o{}^2\right)$.
The equation which defines «distributivity» is:

$$a \cdot (b + c) = a \cdot b + a \cdot c \tag{22}$$

This has, of course, a `reversed' form, (b+c)a = ba+ca: I chose to name the displayed form `left' distributive and this latter form `right' distributive. When cast in the general terms of binary operators, naming multiplication f and addition g, we have, for any legitimate a, b and c:

$$f(a, g(b,c)) = g(f(a,b), f(a,c)) \tag{23}$$

Thus, if we take (A×B|f:C) and (D×E|g:F) as temporary namings for the domains and ranges of our binary operators, we obtaina is in A;

g(b,c) (in F), b and c are in B; (24)

f(a,b) (in C) and b are in D; and (25)

f(a,c) (in C) and c are in E. (26)

so we need F to be a subset of B and C to be a subset of D and of E. I chose to take C=D=E=F=B for this left-distributive case, replacing B with A for right-distributive.

Further reading

An (A×B|:B) may left-distribute over a (B×B|:B): compare and contrast with an (A×A|:|) left-<u>associating</u> over an (A×B|:B). The combination of these forms the cornerstone of the notion of <u>linearity</u>, which underlies such fundamental tools as scalars and vectors.

1.New interpretation of Frey's equation

New substitutes

$$\left.\begin{aligned} (X - A) &= a_o{}^n \\ X &= b_o{}^n \\ (X + B) &= c_o{}^n \end{aligned}\right\} \tag{27}$$

in Frey's equation, [2]:

$$Y^2 = (X - A) \cdot X \cdot (X + B) \tag{28}$$

the new equations to take out enabling:

$$Y^2 = a_o{}^n \cdot b_o{}^n \cdot c_o{}^n \tag{29}$$

Equations (29) are endless series equations of the non-modular elliptic curves for all exponents $n \geq 2$.

Here a_o, b_o, c_o primitive Pythagorean triads, which according to [2] are determined the following way:
If whole numbers v and u are such, that

$$v > u > 0 \tag{30}$$

and Greatest Common Divisor-

$$GCD\,(v,u) = 1, \tag{31}$$

at v>u of different evenly, than triads (a_0, b_0, c_0), given by equations:

$$\left.\begin{aligned} a_o &= v^2 - u^2 \\ b_o &= 2v \cdot u \\ c_o &= v^2 + u^2 \end{aligned}\right\} \tag{32}$$

are primitive solutions of the equation of Pythagorean:

$$a_o^2 + b_o^2 = c_o^2 \tag{33}$$

2. Non-modular forms and non-modular elliptic curves as way to finally proof Fermat's Last theorem

2.1 *Complex flatness H and non-modular cusp forms*

Let N natural numbers and k whole numbers. Non-modular cups forms of level N and about k by weight called the analytical function $f(S)$ over the flatness H, see Pic.1 and Pic.2, which meet the conditions:

$$f\left(\frac{a_o^2 \cdot S + b_o^2}{c_o^2 \cdot S + d_o^2}\right) = (c_o^2 \cdot S + d_o^2)^k \cdot \zeta(S) \tag{34}$$

for any square primitive Pythagorean's triplets a_o^2, b_o^2, c_o^2 and at the same time d_o^2 without exception will not divide N in following equations:

$$a_o^2 \cdot d^2 - b_o^2 \cdot c_o^2 = 1 \tag{35}$$

Comment:

Let N whole number and let $\Gamma_o(N)$ is set of all 2×2 matrix:

$$\begin{pmatrix} a_o^2 & b_o^2 \\ c_o^2 & d_o^2 \end{pmatrix} \tag{36}$$

Then group $\Gamma_o(N)$ efficacious an H by formula:

$$\begin{pmatrix} a_o^{\,2} & b_o^{\,2} \\ c_o^{\,2} & d_o^{\,2} \end{pmatrix} \cdot S = \frac{a_o^{\,2} \cdot S + b_o^{\,2}}{c_o^{\,2} \cdot S + d_o^{\,2}} \qquad (37)$$

That is to say:

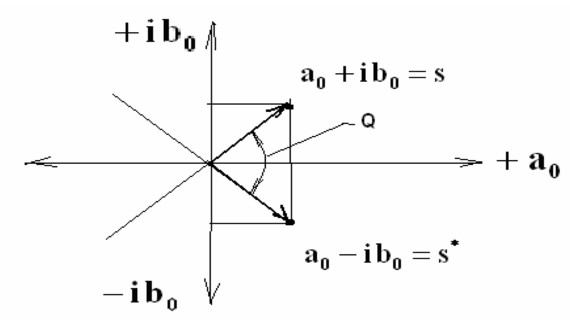
$$H = \{\ S = (a_o + i \cdot b_o) \cdot (a_o - i \cdot b_o) = a_o^{\,2} + b_o^{\,2} = c_o^{\,2}\ \} \qquad (38)$$

complex flatness over of the multitude Pythagorean's triplets, see Pic.1 and Pic.2.
Formula (35) contains complex function:

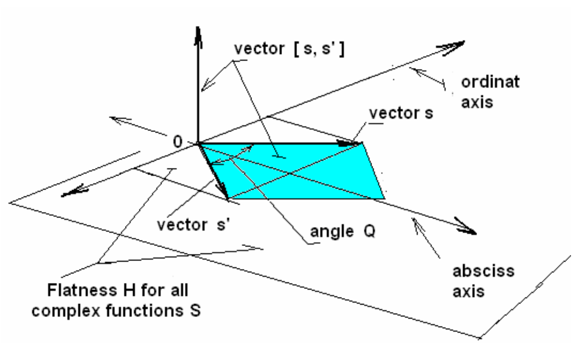
$$\begin{aligned} S = s \cdot s^* &= (a_o + i \cdot b_o) \cdot (a_o - i \cdot b_o) = \\ &= a_o^{\,2} + b_o^{\,2} = c_o^{\,2} \end{aligned} \qquad (39)$$

and Riemann's zeta function:

$$\zeta(S) = 2^S \cdot \pi^{S-1} \cdot \sin\frac{\pi S}{2} \cdot \Gamma\,(1 - S) \cdot \zeta(1 - S) \qquad (40)$$



Pic.1



Pic.2

Complex function S is general mathematical invariant for flatness H and at the same time it is complex function over field N of all natural numbers v > u, see (30), (32).

2.2 Special properties of complex numbers s, s^*
and Pythagorean's numbers

The member of Russian Academy of Sciences, famous mathematician G. Pontryagin , see.[6] and Pic.1 and Pic.2, learning properties of complex numbers:

$$\left.\begin{aligned} & s = a_o + i\,b_o \\ & s^* = a_o - i\,b_o \\ & \qquad \text{or} \\ & z = \xi + i\,\zeta \\ & z' = \xi - i\,\zeta \end{aligned}\right\} \tag{41}$$

discovered their polysemy, which was seen by G.V.Leibnitz in his time , as "unexplained wonder».
Complex numbers can be in the same time, see Pic.1 and Pic.2:
a) complex numbers,
в) points representing these numbers on complex plane,
c) vectors, corresponding to these numbers.

The length of such vectors is determined by module:

$$\left.\begin{aligned} & |s| = \left|s^*\right| = \sqrt{a_o^{\,2} + b_o^{\,2}} \\ & \qquad\qquad \text{or} \\ & |z| = |z'| = \sqrt{\xi^2 + \zeta^2} \end{aligned}\right\} \tag{42}$$

because of that there can be formulas given above.
Thus we have a possibility to consider primitive Pythagorean numbers

$$c_o = v^2 + u^2 \tag{43}$$

as a basis of two forms of general complex invariants (two forms of complex functions)

$$S \; = (a_o^{\,2} + b_o^{\,2}) = [(a_o^{\,2} - (i \cdot b_o)^2] = c_o^{\,2} \tag{44}$$

$$S = s \cdot s^* = (a_o + i \cdot b_o) \cdot (a_o - i \cdot b_o) = \\ = a_o^2 + b_o^2 = c_o^2 \qquad (45)$$

And also - as a basis of spectral invariant

$$\lambda = (c_o^o + c_o^{-1} + c_o^{-2} + c_o^{-3} + ... + c_o^{-n} + ...) \quad \text{if} \quad n \to \infty \qquad (46)$$

At that whole numbers $c_o = \sqrt{S} = v^2 + u^2$ make a basis for infinite numbers of whole-numbered decisions of the system of equation:

$$\left. \begin{array}{l} f_n(v > u) = c^n \quad \text{if} \quad n = 0, 1, 2, 3, ... \\ x_*^n + y_*^n = z_*^n \quad \text{if} \quad n \geq 2 \\ A^x + B^y = C^z \end{array} \right\} \qquad (47)$$

where as fragment proof of Birch and Swinnerton-Dyer Conjecture

$$\left. \begin{array}{l} f_0(v > u) = c_o^0 = 1 \\ f_1(v > u) = c_o^1 = v^2 + u^2 \\ f_2(v > u) = c_o^2 = v^4 + 2v^2u^2 + u^4 \\ f_3(v > u) = c_o^3 = v^6 + u^6 + 3v^4u^2 + 3u^4v^2 \\ f_4(v > u) = c_o^4 = v^8 + u^8 + 6v^4u^4 + 4v^6u^4 + 4u^6v^4 \\ \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots \\ f_n(v > u) = c_o^n = (v^2 + u^2)^n \quad \text{if} \ n \to \infty \end{array} \right\} \qquad (48)$$

2.3 Theorem for (47)

Conjecture Beal: Let $B_i = (A, B, C, x, y, z)$ be positive integers with $x, y, z > 2$.
If $A^x + B^y = C^z$, then $x, y, z > 2$ have a common factor.

2.4 P r o o f Theorem

If $S_3 = (3^3)^n$ mathematical fractal, then

$$\left.\begin{aligned} A^x &= 3^{3n} \\ B^y &= 2^3 \cdot 3^{3n} \\ C^z &= 3^2 \cdot 3^{3n} \end{aligned}\right\} \tag{49}$$

Consequently :

$$\left.\begin{aligned} A &= \sqrt[x]{3^{3n}} \\ B &= \sqrt[y]{2^3 \cdot 3^{3n}} \\ C &= \sqrt[z]{3^2 \cdot 3^{3n}} \end{aligned}\right\} \tag{50}$$

where :

$$\left.\begin{aligned} x &= 3n \\ y &= \frac{3 \cdot \ln 2 + 3 \cdot n \cdot \ln 3}{\ln B} \\ z &= 2 + 3n \end{aligned}\right\} \tag{51}$$

Result: we create endless series equations by Beal:

$$A^x + B^y = C^z \tag{52}$$

as basis for decisions of Fermat's equation, see (47).

2.5 Exemplification

If n=4, then according (50):

$$\left.\begin{aligned} A &= 3 \\ B &= 162 \\ C &= 3 \end{aligned}\right\} \tag{53}$$

According (51) :

$$\left.\begin{aligned} x &= 3 \cdot 4 = 12 \\ y &= \frac{3 \cdot \ln 2 + 3n \cdot \ln 3}{\ln B} = \\ &= \frac{2.079441542 + 13.18334746}{5.097596335} = 3 \\ z &= 2 + 3 \cdot 4 = 14 \end{aligned}\right\} \tag{54}$$

Examination :

$$\left.\begin{array}{l} 3^{12} = 531441 \\ 162^{3} = 4251528 \\ 3^{14} = 4782969 \\ 531441 + 4251528 = 4782969 \end{array}\right\} \qquad (55)$$

2. 6 General consequently

Equation:

$$3^{12} + 162^{3} = 3^{14} \qquad (56)$$

is equivalent of Fermat's equation:

$$\left.\begin{array}{l} 81^{3} + 162^{3} = 168.4867897^{3} \\ 531441 + 4251528 = 168.4867897^{3} \end{array}\right\} \qquad (57)$$

where common multiplier:

$$3^{3n} = 3^{12} = 531441 \qquad (58)$$

For every equation (57) there is a certain well known statement of P,Fermat:

«Cubum autem in duos cubos, aut quadrato-quadratum in duos in quadrato-quadratos, et generaliter nullam in infinitum ultra quadratum potestatem in duas ejusdem nominis fas est dividere; cujus rei demonstrationem mirabilem same detexi»

«It is impossible to factorize one cube into two cubes, or square into two bi-squares or generally power, more than 2 into two degrees with the same index of degree; ….»

3. General solution Fermat's Last theorem (possibly way)

Let Beal's equation:

$$A^{x} + B^{y} = C^{z} \qquad (59)$$

If according (49) exit substitutions:

$$\left.\begin{aligned} A^{x} &= 3^{3n} \\ B^{y} &= 2^{3} \cdot 3^{3n} \\ C^{z} &= 3^{2} \cdot 3^{3n} \end{aligned}\right\} \qquad (60)$$

then for all $n \geq 2$ bring about endless series general or basis equations:

$$3^{3n} + 2^{3} \cdot 3^{3n} = 3^{2\cdot} \cdot 3^{3n} \qquad (61)$$

as equivalents for endless series of Fermat's equations , see (47):

$$x_{*}{}^{n} + y_{*}{}^{n} = z_{*}{}^{n} \qquad (62)$$

From these identification equations, (61) and (62), we derive the following universal formulas for determining the roots of Fermat's equations (62) as the part of unique system equations (96) and as the part of general system equations (47) ;

$$\left.\begin{aligned} x_{*} &= \sqrt[n]{3^{3n}} \\ y_{*} &= \sqrt[n]{2^{3} \cdot 3^{3n}} \\ z_{*} &= \sqrt[n]{3^{2} \cdot 3^{3n}} \end{aligned}\right\} \qquad (63)$$

It is way to solution a riddle of P.Fermat:

«It is impossible to factorize one cube into two cubes, or square into two bi-squares or generally power, more than 2 into two degrees with the same index of degree».

It is result, which not only repudiates proof of Wiles, but lets glorify group of Abel, as a basis and mathematical instrument of real solution of the Last theorem of Fermat, Riemann's hypothesis and Beel's hypothesis as common problem of numbers theory.

According of Gedel's theorem, it is final "Algorithm" for calculation a roots of system equations of P.Fermat , see [15] :

«Without overburdening your attention by extra information on that problem,
I will mark the main feature of the mentioned above definition of "Algorithm".

Aggregate of all initial data to which algorithm is applied is called «sphere of use of algorithm».
Each algorithm gives function, referred to each element of sphere of use by corresponding result.

Sphere of use of this function coincides with «sphere of use of algorithm».
They say that examined algorithm calculates a function, given by the mentioned method.
Special interest make functions, arguments and meanings of which are natural numbers.»
So,

«Though term mathematics is almost the main in mathematics, it doesn't have exact definition. We will assume existence of different concept of proof.. At that we will demand presence of effective method or algorithm and also check – if the viewed proof is a proof»

Explanatory example for n=15 :

$$\left.\begin{aligned} x_* &= \sqrt[15]{3^{3\cdot 15}} = 27 = \text{Const} \\ y_* &= \sqrt[15]{2^3 \cdot 3^{3\cdot 15}} = 31.01485559... \\ z_* &= \sqrt[15]{3^2 \cdot 3^{3\cdot 15}} = 31.25934916.... \end{aligned}\right\} \tag{64}$$

Examination :

$$\left.\begin{aligned} &27^{15} = 2.9543127 \cdot 10^{21} \\ &(31.01485559...)^{15} = 2.3634502 \cdot 10^{22} \\ &(31.25934916...)^{15} = 2.6588814 \cdot 10^{22} \\ &2.9543127 \cdot 10^{21} + 2.3634502 \cdot 10^{22} = 2.6588815 \cdot 10^{22} \end{aligned}\right\} \tag{65}$$

Number $x = 27$, see (64), is invariant for all canonical forms of the elliptic curves:

$$y^2 = x^3 + a \cdot x + b \tag{66}$$

For good form (66) exist computing discriminant:

$$\Delta = -\left(4a^3 + \frac{27}{b^2}\right) \tag{67}$$

(67)

which contains number – invariant:

$$27 = -\left(\frac{\Delta + 4 \cdot a^3}{b^2}\right) \tag{68}$$

For (27) - (38) we have new interpretation this fundamental number:

$$27 = -\left(\frac{\Delta + 4 \cdot a_o{}^3}{b_o{}^2}\right) \tag{69}$$

General conclusion: Fermat's Last Theorem is finally solved

4.Theoretical basis for described General conclusion.

4.1 Proven fact: exist endless series non-modular cusp forms, and endless series complex function), see (34)-(38) **(70)**

4.2 Exist endless series squares primitive numbers of Pythagorean:

$$c_o^2 = a_o^2 + b_o^2 = (v^2 - u^2)^2 + (2 \cdot v \cdot u)^2 \qquad (71)$$

as link between following forms:

$$\left.\begin{aligned} a_o &= v^2 - u^2 \\ b_o &= 2v \cdot u \\ c_o &= v^2 + u^2 \end{aligned}\right\} \qquad (72)$$

4.3 endless series complex function). **(73)**

$$H = \{\ S = (a_o + i \cdot b_o) \cdot (a_o - i \cdot b_o) = a_o^2 + b_o^2 = c_o^2\ \} \qquad (74)$$

4.4 Exist new substitutes **(75)**

$$\left.\begin{aligned} (X - A) &= a_o^n \\ X &= b_o^n \\ (X + B) &= c_o^n \end{aligned}\right\} \qquad (76)$$

in Frey's equation, [2]:

$$Y^2 = (X - A) \cdot X \cdot (X + B) \qquad (77)$$

4.5 Exist the new equations to take out enabling roots calculation: **(78)**

$$Y_o^2 = a_o^n \cdot b_o^n \cdot c_o^n \quad \Rightarrow \quad x_*^n + y_*^n = z_*^n \qquad (79)$$

$$\left.\begin{aligned} x_* &= \sqrt[n]{F'_a} = \sqrt[n]{a_o{}^2 \cdot D_n} \\ y_* &= \sqrt[n]{F'_b} = \sqrt[n]{b_o{}^2 \cdot D_n} \\ z_* &= \sqrt[n]{F'_c} = \sqrt[n]{c_o{}^2 \cdot D_n} \end{aligned}\right\} \qquad (80)$$

where

$$D_n = (a_o{}^{n-2} + b_o{}^{n-2} + c_o{}^{n-2}) / 3 \qquad (81)$$

universal common multiplier

4.6 Exist formulas (63), according Gedel's theorem, [1] and [15], **(82)**

are calculate roots for system Fermat's equations, for all $n \geq 2$**:**

$$\left.\begin{aligned} x_*{}^2 + y_*{}^2 &= z_*{}^2 \\ x_*{}^3 + y_*{}^3 &= z_*{}^3 \\ x_*{}^4 + y_*{}^4 &= z_*{}^4 \\ x_*{}^5 + y_*{}^5 &= z_*{}^5 \\ &\cdots\cdots\cdots \\ x_*{}^n + y_*{}^n &= z_*{}^n \end{aligned}\right\} \qquad (83)$$

***4.7 Exist transformational model a matrix of H.Poincare* [8] *and* [9]:** **(84)**

$$S^*{}_1 = \begin{vmatrix} a_1 \cdot a_o{}^2 & a_2 \cdot a_o{}^2 & a_3 \cdot a_o{}^2 \\ b_1 \cdot b_o{}^2 & b_2 \cdot b_o{}^2 & b_3 \cdot b_o{}^2 \\ c_1 \cdot c_o{}^2 & c_2 \cdot c_o{}^2 & c_3 \cdot c_o{}^2 \end{vmatrix} \qquad (85)$$

determinant which zero:

$$\begin{aligned}
&\text{Det } S^*{}_1 = \\
&= a_1(a_o{}^2 \cdot b_o{}^2 \cdot c_o{}^2)\cdot(c_2b_3 - b_2c_3) + \\
&+ a_2(a_o{}^2 \cdot b_o{}^2 \cdot c_o{}^2)\cdot(c_3b_1 - b_3c_1) + \\
&+ a_3(a_o{}^2 \cdot b_o{}^2 \cdot c_o{}^2)\cdot(c_1b_2 - c_2b_1) = 0
\end{aligned} \tag{86}$$

where

$$(c_2b_3 - b_2c_3) = (c_3b_1 - b_3c_1) = (c_1b_2 - c_2b_1) = 0 \tag{87}$$

and

$$(a_o{}^2 \cdot b_o{}^2 \cdot c_o{}^2) = Y^2 \tag{88}$$

cubic as common multiplier.

4.8 Exist cubic constituent part of $\text{Det } S^*{}_1$ *as new form of Frey's equation:* (89)

$$\begin{aligned}
&a_o{}^2 \cdot b_o{}^2 \cdot c_o{}^2 = \\
&= (X - A)\cdot X \cdot (X + B) = \\
&= Y^2
\end{aligned} \tag{90}$$

4.9 Exist general system equations: (91)

$$\left.\begin{aligned}
&f_n(v > u) = c^n \quad \text{if} \quad n = 0, 1, 2, 3, \ldots \\
&x_*{}^n + y_*{}^n = z_*{}^n \quad \text{if} \quad n \ge 2 \\
&A^x + B^y = C^z
\end{aligned}\right\} \tag{92}$$

which accurate development have

4.10 Notice:

If plane curve, [4]:

$$f(x,y) = \alpha_{30} \cdot x^3 + \alpha_{21} \cdot x^2 \cdot y + \ldots + \alpha_1 \cdot x + \alpha_2 \cdot y + \alpha_0 \tag{93}$$

then

$$f(x,y) = f_1(x,y) \cdot f_2(x,y) \tag{94}$$

confluent equations (equations for elliptic curves)

If in equations (93) all coefficients α rational numbers, then:

$$f(x,y) \Rightarrow y^2 = x^3 + a \cdot x + b \qquad (95)$$

Equation $y^2 = x^3 + a \cdot x + b$ called canonical form of elliptic curves, see (95).

This equation is basis for theoretical error:

All elliptical curves are modular curves

It is basis for error proof of Wiles, see [2], [3], [4], [5].

This equation can be in the same time basis for finally and accurate development Fermat's Last Theorem.

Proof [7] of the Great theorem of Fermat, results of which were used in that article, lets make (construct) infinite number of cubic (79) as equivalent (90). Proof of Wiles doesn't have this opportunity for the simple reason:

In the basis of Wiles lies false hypothesis of Shimura-Taniyama [2], [4]:

All elliptical curves are modular curves

But I made on the basis of Frey's equation infinite number of

Non –modular elliptical curves, see (79) .

For this reason I can construct infinite number of cubical equations, solved in whole numbers, see «Introduction», (5) – (12) , and transformational model a matrix of H.Poincare , see (84) and [8] , [9].

5. About Gordan's problem and about new Frey's equation

David Hilbert reduced the Gordan's problem to the following question the formulation of which indicated the way of solving the problem:
«Preset is the infinite system of forms from the finite number of variables. In our case –this infinitely multitude of equations»
In our case-this if infinitely multitude of equations, see [7], [10]:

$$\left.\begin{aligned} &x_*^{\,2}+y_*^{\,2}=z_*^{\,2}\\ &x_*^{\,3}+y_*^{\,3}=z_*^{\,3}\\ &x_*^{\,4}+y_*^{\,4}=z_*^{\,4}\\ &x_*^{\,5}+y_*^{\,5}=z_*^{\,5}\\ &\cdots\cdots\cdots\cdots\cdots\\ &x_*^{\,n}+y_*^{\,n}=z_*^{\,n} \end{aligned}\right\} \qquad (96)$$

Each of which is realized at a concrete exponent of power n .

Further on, Hilbert's question is verbalized as follows:

«Ai which conditions exist the finite system of the forms through which all others are expressed as the linear combinations, whose coefficients are the integral rational functions of the same variables? »

In our case, use is made of three general forms:

$$F'_a = a_o^{\,2}\cdot(a_o^{\,n-2}+b_o^{\,n-2}+c_o^{\,n-2})/3 \qquad (97)$$

$$F'_b = b_o^{\,2}\cdot(a_o^{\,n-2}+b_o^{\,n-2}+c_o^{\,n-2})/3 \qquad (98)$$

$$F'_c = c_o^{\,2}\cdot(a_o^{\,n-2}+b_o^{\,n-2}+c_o^{\,n-2})/3 \qquad (99)$$

for roots (80) of system equations (90),

and general series secondary forms:

$$A_i = \pm\,(b_o^{\,2}-a_o^{\,2}) \qquad (100)$$

as consequently new substitutes (76) for Frey's cubic :

$$Y^2 = (X-A)\cdot X\cdot(X+B) \qquad (101)$$

The system equations (101) is realized at a concrete endless series five special forms :

$$\left.\begin{aligned} &A^*{}_1=(b_o^{\,2}-a_o^{\,2})\ \text{ if } b_o>a_o\\ &A^*{}_2=(a_o^{\,2}-b_o^{\,2})\ \text{ if } a_o>b_o\\ &A^*{}_3=(b_o-a_o)\ \text{ if } b_o>a_o\\ &A^*{}_4=(a_o-b_o)\ \text{ if } a_o>b_o\\ &A^*{}_5=c_o \end{aligned}\right\} \qquad (103)$$

as basis for three Rule – Rule № A , Rule № B and Rule № C.

Attention :

The second fundamental «nucleus» of natural numbers, see (185):

$$J_7 = 1, 2, 3, 4, 5, 6, 7 \tag{104}$$

contains three even numbers:

$$2, 4, 6 \tag{105}$$

$$(A^*{}_i - A^*{}_{i-1}) = 2 \cdot \lambda_2 = 4 = 2 \cdot 2 \tag{106}$$

$$(A^*{}_i - A^*{}_{i-1}) = 3 \cdot \lambda_2 = 6 = 2 \cdot 3 \tag{107}$$

which size up of the principal intervals between prime numbers, see (205) and Table № 1.

6. Ternary and quaternary cubic forms of the numbers theory by H.Poincare as key to a proof of Fermat's Last Theorem

(Short algorithm)

In the first publication of theory of numbers, see Journal de l'Ecole politechnique,1881, Cahier 50, 190-253, in the introduction, Poincare marks the following:

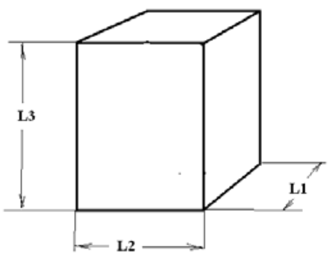
«Arithmetic research of homogenous forms is one of the most interesting questions of theory of numbers and of the questions,which are most interesting for geometrysts.» .
This statement of Poincare is enough realized Principle of general co-variation, [12] .
The aim of this article is to confirm geometric essence of one special paragraph of Poincare's theory of numbers which contains information about exact geometric proof of the Last theorem by Fermat, see Pic.3, and Riemann's Hypothesis.

Representative example.

According Principle of general co-variation, Frey's elliptic curve:

$$Y^2 = (X - A) \cdot X \cdot (X + B) \tag{108}$$

be of universal geometrical equivalent:



where:

$$L1=(X-A)=x^n=a_o{}^n \quad ; \quad L2=X=y^n=b_o{}^n \quad ; \quad L3=(X+B)=z^n=c_o{}^n \tag{109}$$

Result- new forms of Frey’s equation:

$$\left.\begin{aligned} Y^2 &= x^n \cdot y^n \cdot z^n \\ Y^2 &= a_o{}^n \cdot b_o{}^n \cdot c_o{}^n \end{aligned}\right\} \tag{110}$$

In publication [8] , translated into Russia, see. [9] , H.Poincare reported :

«Everything we have spoken before, can be applied only to main reduction forms, so to them we can give the following results:
1) Each class commonly saying is only one main reduction form;
2) There are infinitely many classes;
3) Main reduction forms are divided into three types;
4) Form of the first and second type is a finite number;
5) Forms of the third type are divided into infinite multitude of sorts, and each sort contains infinitely mane reduction forms. Let's attend to secondary reduction forms.»From analysis of these forms let's choose a fragment, which has a link to geometric proof of the Fermat’s Last theorem .

This fragment Poincare explains the following way, see[8] chapt.12 and p.889 in [9]:

«As three simple numbers a_1, a_2, a_3 are mutually simple, there are always Nine Whole Numbers, satisfying the following conditions:

$$\left.\begin{aligned} a_1\alpha_1 + a_2\alpha_2 + a_3\alpha_3 &= 1 \\ a_1 &= \beta_2\gamma_3 - \beta_3\gamma_2 \\ a_2 &= \beta_3\gamma_1 - \beta_1\gamma_3 \\ a_3 &= \beta_1\gamma_2 - \beta_2\gamma_1 \end{aligned}\right\} \tag{111}$$

According «Journal de I’Ecole Polytechnique, 1882, Cahier 51, 45-91, chapt. 12, exist multiple-meaning matrix of H.Poincare:

$$S_1 = \begin{vmatrix} a_1 \cdot h & a_2 \cdot h & a_3 \cdot h \\ b_1 \cdot k & b_2 \cdot k & b_3 \cdot k \\ c_1 \cdot l & c_2 \cdot l & c_3 \cdot l \end{vmatrix} \tag{112}$$

It is substitution for $H \Rightarrow F$ where, see [8] chapt.12 and [9], p. 884, 888:

$$H = 3 \cdot X_1{}^2 \cdot X_3 + X_2{}^3 \tag{113}$$

is equivalent of canonical form, see [9] , p. 830:

$$\alpha \cdot z^3 + \beta \cdot x \cdot y^2 \tag{114}$$

for secondary reduced forms numbers theory of Poincare, with whole coefficients α, β .

and with unknown variable $x\ y, z$.

According Poincare all forms $F \in H$.

At the same time:

$$F = \begin{vmatrix} \lambda & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & \frac{1}{\lambda^2} \end{vmatrix} \times S_1 \tag{115}$$

If , see (112) :

$$h = a_o{}^2 \ , \ k = b_o{}^2 \ , \ l = c_o{}^2 \tag{116}$$

then turned new matrix, see (85) :

$$S^*{}_1 = \begin{vmatrix} a_1 \cdot a_o{}^2 & a_2 \cdot a_o{}^2 & a_3 \cdot a_o{}^2 \\ b_1 \cdot b_o{}^2 & b_2 \cdot b_o{}^2 & b_3 \cdot b_o{}^2 \\ c_1 \cdot c_o{}^2 & c_2 \cdot c_o{}^2 & c_3 \cdot c_o{}^2 \end{vmatrix} \tag{117}$$

Here whole numbers (a_1, a_2, a_3) , (b_1, b_2, b_3) and (c_1, c_2, c_3) are mutually simple numbers.

According [7] exist 9 invariants – forms as calculation key these numbers::

$$\left.\begin{aligned} a_1 &= a_1'^2 = a_o{}^2(a_o{}^{n-2}) \\ a_2 &= a_2'^2 = a_o{}^2(b_o{}^{n-2}) \\ a_3 &= a_3'^2 = a_o{}^2(c_o{}^{n-2}) \end{aligned}\right\} \tag{118}$$

$$\left.\begin{aligned} b_1 &= b_1'^2 = b_o{}^2(a_o{}^{n-2}) \\ b_2 &= b_2'^2 = b_o{}^2(b_o{}^{n-2}) \\ b_3 &= b_3'^2 = b_o{}^2(c_o{}^{n-2}) \end{aligned}\right\} \tag{119}$$

$$\left.\begin{aligned} c_1 &= c_1'^2 = c_o{}^2(a_o{}^{n-2}) \\ c_2 &= c_2'^2 = c_o{}^2(b_o{}^{n-2}) \\ c_3 &= c_3'^2 = c_o{}^2(c_o{}^{n-2}) \end{aligned}\right\} \tag{120}$$

where, according [7]:

$$\left.\begin{aligned} a'_1 &= a_o \times \sqrt{a_o{}^{n-2}} \\ a'_2 &= a_o \times \sqrt{b_o{}^{n-2}} \\ a'_3 &= a_o \times \sqrt{c_o{}^{n-2}} \end{aligned}\right\} \qquad (121)$$

$$\left.\begin{aligned} b'_1 &= b_o \times \sqrt{a_o{}^{n-2}} \\ b'_2 &= b_o \times \sqrt{b_o{}^{n-2}} \\ b'_3 &= b_o \times \sqrt{c_o{}^{n-2}} \end{aligned}\right\} \qquad (122)$$

$$\left.\begin{aligned} c'_1 &= c_o \times \sqrt{a_o{}^{n-2}} \\ c'_2 &= c_o \times \sqrt{b_o{}^{n-2}} \\ c'_3 &= c_o \times \sqrt{c_o{}^{n-2}} \end{aligned}\right\} \qquad (123)$$

At last we have come to a final. All the chain of described above substitutes is closed on conditions of Poincare's substitutes [8] chapt.12 and [9] p.889:

$$\left.\begin{aligned} a_1\alpha_1 + a_2\alpha_2 + a_3\alpha_3 &= 1 \\ a_1 &= \beta_2\gamma_3 - \beta_3\gamma_2 \\ a_2 &= \beta_3\gamma_1 - \beta_1\gamma_3 \\ a_3 &= \beta_1\gamma_2 - \beta_2\gamma_1 \end{aligned}\right\} \qquad (124)$$

First condition of Poincare:

$$a'_1\alpha'_1 + a'_2\alpha'_2 + a'_3\alpha'_3 = 1 \qquad (125)$$

in our case it is widened up to three corresponding conditions:

$$\left.\begin{aligned}&(a'_1\alpha'_1 + a'_2\,\alpha'_2 + a'_3\alpha'_3)/3F'_a = 1\\&(b'_1\beta'_1 + b'_2\beta'_2 + b'_3\beta'_3)/3F'_b = 1\\&(c'_1\gamma'_1 + c'_2\gamma'_2 + c'_3\gamma'_3)/3F'_c = 1\end{aligned}\right\} \tag{126}$$

The result of such geometric constructions is a construction of three main algebraic invariants.

The F i r s t (smallest) invariant in which are used marks of sides of the rectangle drawn in the bottom of the drawing :

$$F'_a = a'_1 \times \alpha'_1 = a'_2 \times \alpha'_2 = a'_3 \times \alpha'_3 \tag{127}$$

The same way are made

S e c o n d (medium) invariant:

$$F'_b = b'_1 \times \beta'_1 = b'_2 \times \beta'_2 = b'_3 \times \beta'_3 \tag{128}$$

and T h i r d (biggest) invariant :

$$F'_c = c'_1 \times \gamma'_1 = c'_2 \times \gamma'_2 = c'_3 \times \gamma'_3 \tag{129}$$

Form (127) contains 9 invariants :

$$\left.\begin{aligned}&\alpha'_1 = (a_o \times D_n)/\sqrt{a_o{}^{n-2}}\\&\alpha'_2 = (a_o \times D_n)/\sqrt{b_o{}^{n-2}}\\&\alpha'_3 = (a_o \times D_n)/\sqrt{c_o{}^{n-2}}\end{aligned}\right\} \tag{131}$$

$$\left.\begin{aligned}&\beta'_1 = (b_o \times D_n)/\sqrt{a_o{}^{n-2}}\\&\beta'_2 = (b_o \times D_n)/\sqrt{b_o{}^{n-2}}\\&\beta'_3 = (b_o \times D_n)/\sqrt{c_o{}^{n-2}}\end{aligned}\right\} \tag{132}$$

$$\left.\begin{aligned}&\gamma'_1 = (c_o \times D_n)/\sqrt{a_o{}^{n-2}}\\&\gamma'_2 = (c_o \times D_n)/\sqrt{b_o{}^{n-2}}\\&\gamma'_3 = (c_o \times D_n)/\sqrt{c_o{}^{n-2}}\end{aligned}\right\} \tag{133}$$

Result – possess a solution of Fermat’s system equations (83) :

$$\left.\begin{aligned} a_* &= \sqrt[n]{F'_a} \\ b_* &= \sqrt[n]{F'_b} \\ c_* &= \sqrt[n]{F'_c} \end{aligned}\right\} \quad (134)$$

where;

$$F'_a = a_o^{\,2} \cdot (a_o^{\,n-2} + b_o^{\,n-2} + c_o^{\,n-2})/3 \quad (135)$$

$$F'_b = b_o^{\,2} \cdot (a_o^{\,n-2} + b_o^{\,n-2} + c_o^{\,n-2})/3 \quad (136)$$

$$F'_c = c_o^{\,2} \cdot (a_o^{\,n-2} + b_o^{\,n-2} + c_o^{\,n-2})/3 \quad (137)$$

as equivalent , see (127)-(130) :

$$F'_a = a'_1 \times \alpha'_1 = a'_2 \times \alpha'_2 = a'_3 \times \alpha'_3 \quad (138)$$

the same way are made

S e c o n d (medium) invariant:

$$F'_b = b'_1 \times \beta'_1 = b'_2 \times \beta'_2 = b'_3 \times \beta'_3 \quad (139)$$

and T h i r d (biggest) invariant :

$$F'_c = c'_1 \times \gamma'_1 = c'_2 \times \gamma'_2 = c'_3 \times \gamma'_3 \quad (140)$$

It is general and final link between of Frey's equation, Fermat's equation and elliptic curves because :

Between the cubic

$$y^2 = x^3 + a \cdot x^2 + b \cdot x + c \quad (141)$$

and canonical forms elliptic curves :

$$y^2 = x^3 + a \cdot x + b \quad (142)$$

and ternary forms of numbers theory of Poincare , see [9] , p. 830 , 884 :

$$\left.\begin{aligned} &\alpha \cdot z^3 + 3 \cdot \beta \cdot x \cdot y^2 \\ &H = 3 \cdot X_1^{\,2} \cdot X_3 + X_2^{\,3} \end{aligned}\right\} \quad (143)$$

exist correlation dependence:

$$\left.\begin{aligned} &(\alpha \cdot z^3 + 3 \cdot \beta \cdot x \cdot y^2) \Rightarrow H \Rightarrow (y^2 = x^3 + a \cdot x + b) \\ &\text{according} \quad H \Rightarrow S^*{}_1 \end{aligned}\right\} \quad (144)$$

6.1 New behaviour of Frey's equation

Frey uses the following substitutions , see :

$$A = a^q \quad \text{and} \quad B = b^q \tag{145}$$

For cubic:

$$Y^2 = (X - A) \cdot X \cdot (X + B) \tag{146}$$

Also Fermat's equation

$$a^n + b^n = c^n \tag{147}$$

contains three members, the author [8] forms not two, but three substitutions, changing simple number q for any whole number $n \ge 2$:

$$\left.\begin{array}{l} A = a^n \\ B = b^n \\ C = c^n \end{array}\right\} \tag{148}$$

In the result Fermat's equation gets simple phenomenological formulas for calculation of its primitive solutions at any index of degree $n \ge 2$, see (134)-(140) :

$$\left.\begin{array}{l} a_* = \sqrt[n]{A} \\ b_* = \sqrt[n]{B} \\ c_* = \sqrt[n]{C} \end{array}\right\} \tag{149}$$

Any non-primitive solutions of Fermat's equation are calculated by simple multiplying of primitive solutions to any common multiplier S :

$$\left.\begin{array}{l} a = a_* \times S \\ b = b_* \times S \\ c = c_* \times S \end{array}\right\} \tag{150}$$

Further widening of infinite number of calculated solutions of Fermat's equation are don with the help of any root multiplier, including special multiplier:

$$D_n = ({a_o}^{n-2} + {b_o}^{n-2} + {c_o}^{n-2}) / 3 \tag{151}$$

In this case we get universal forms:

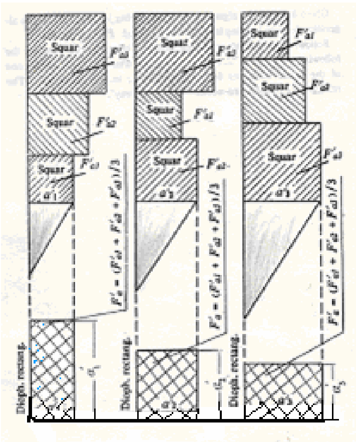
$$\left.\begin{array}{l} x = \sqrt[n]{A \times D_n} \times S \\ y = \sqrt[n]{B \times D_n} \times S \\ z = \sqrt[n]{C \times D_n} \times S \end{array}\right\} \tag{152}$$

for solution of Fermat's equation:

$$x^n + y^n = z^n \quad (153)$$

Notice.

According to [7] in space of Diophantine variety one can build nine invariant algebraic forms, numeric meanings of which are defined high's of Diophantine rectangles , see Pic.3 .



Pic.3

According Pic.3 , three of construction of equidimensional in area Diophantine rectangles, yielding the same result-smaller invariant F'_a of Diophantine space. Given below is the algorithm for constructing invariant F'_a . The algorithm for constructing invariants F'_b and F'_c is similar.

Dislike the Pythagorean triangles, the Diophantine rectangles are constructed on the sides of the Diophantine triangles but not the geometrical squares, see Pic.3 and explanations to this figure. Areas F'_a , F'_b , F'_c of the Diophantine rectangles as to their numerical values are a d e q u a t e t o t h e n u m e r i c a l v a l u e s of the radicands of formulas (80).

7. Proof of Riemann's Hypothesis

It is original and novel results analysis of knowledge data about natural and primes-numbers, about primitive triplets of Pythagorean, about equations of Pythagorean's, P.Fermat's and G.Frey's. General result – three Rules: Rule № A, Rule № B and Rule № C for separate, exarticulate and calculate endless series prime-numbers and a endless series zeros an flatness complex functions and an Riemann's sphere.

Author offer decision of Riemann's Hypothesis on basis of the general formula ,which contains complex numbers. The general formula has been published in December, 2005 in materials of 13-th International Scientific Conference "Problems of management by safety of complex systems ", in Moscow. From the article the conclusion that the problem of exarticulation of the infinite lines of the simple numbers is the part of the general (common) problem of the theory of numbers including a problem the Fermat and problem of Gordan [1], also problems Beal, Birch and Swinnerton-Dyer.

7.1. Historical information

The famous Fermat's formula:

$$F(n) = 2^{2^n} + 1 \qquad (154)$$

does not contain such general algorithm.

For n = 5 :

$$F(5) = 641 \times 6\,700\,417 \qquad (155)$$

(author L.Euler, 1732)

Other the well-known formula does not contain such general algorithm:

$$f(n) = n^2 - n + 41 \qquad (156)$$

because for n = 41:

$$f(41) = 41 \times 41 \qquad (157)$$

$$f(n) = n^2 - 79n + 1601 \qquad (158)$$

for n = 80 :

$$f(80) = 14321 \qquad (159)$$

This number is compound.

7.2. Riemann Hypothesis,

See http://www.claymath.org/millennium.

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 $\zeta(s) = 1 + 1/2^5 + 1/3^5 + 1/4^5 + \ldots$ called the Riemann function

7.3 General way to proofs of the Riemann's problem

Central place in this hypothesis occupies Zeta function, which not to the full displays distribution of prime– numbers in a natural line of numbers. In December, 2005, in materials of 13-th International Conference on problems of management safety of complex systems, see [13], had been published universal formula for exarticulation of the infinite lines of the simple numbers:

$$A_i = \pm\,(b_o^{\,2} - a_o^{\,2}) \qquad (160)$$

and spectral invariant:

$$\lambda_2 = (2^0 + 2^{-1} + 2^{-2} + 2^{-3} + ... + 2^{-\alpha} + ... + 2^{-\infty}) \to 2 \qquad (161)$$

Alongside with Zeta function of Riemann:

$$\zeta\,(5) = 1/1^5 + 1/2^5 + 1/3^5 + 1/4^5 + ... \qquad (162)$$

author enter new (fundamental) function:

$$\zeta\,(7) = 1/1^7 + 1/2^7 + 1/3^7 + 1/4^7 + ... \qquad (163)$$

and row others zeta functions.

New $\zeta(7)$ function displays only a problem of prime– numbers 7, but also a unique natural phenomenon of magnetism. It is known, that in a mass number A contain number 7 solely isotopes of iron ^{56}Fe, see [14] , Part 7, Tab. P 6:

$$^{52}Fe\,,\ ^{53}F_e\,,\ ^{54}Fe\,,\ ^{55}Fe\,,\ ^{56}Fe\,,\ ^{57}Fe,\ ^{58}Fe\,,\ ^{59}Fe\,,\ ^{60}Fe\,,\ ^{61}Fe \qquad (164)$$

Isotope ^{56}Fe include number 7 and cube-fractal:

$$A = 56 = 2^3 \cdot 7 \qquad (165)$$

Due to this circumstance the theory of prime- numbers gets physical sense.
This fact in once again has confirmed the old truth:
In nature (that is in mathematics as well) everything is in interrelationship all the lot is embraced by direct and indirect ties both visible and invisible, strong and weak. Such ties happen to be found in the most unexpected places. So, the partial proof of the Fermat's Last Theorem in the theory of ideal expansion of Kummer happened to by ties with Bernoullis numbers [16]:

$$B_2\,, B_4\,, B_6\,, ..., B_{l-3} \qquad (166)$$

Autor would like to attract reader's attention to aforementioned example that proves this truth in order to by supported by it once again.
David Hilbert, while solving the problem of Paul Gordan's invariants, presented a universal formulation of this problem in the following way, [10] and [11]:

«Suppose, there is given an endless system of forms of a finite number of variables. Under what circumstances does a finite system of forms exist through which all others are expressed in the form of linear combinations whose coefficients are integral rational functions of the same variables? »

Universality of the given formulation lies in the fact that it contains in a generalized form the description of a final solution of the Fermat's Last theorem and of the Riemann's Hypothesis. David Hilbert reduced the Gordan's problem to the following question the formulation of which indicated the way of solving the Riemann's problem:

«Preset is the infinite system of forms from the finite number of variables».

In our case-this infinitely multitude of equations, according [13], described :

A) General formula for prime numbers:

$$A_i = \pm (b_0^{\ 2} - a_0^{\ 2}) \tag{167}$$

B) New form, see (29):

$$Y^2 = a_o^{\ n} \cdot b_o^{\ n} \cdot c_o^{\ n} = (a_o \cdot b_o \cdot c_o)^n \tag{168}$$

for Frey's equation:

$$Y^2 = (X - A) \cdot X \cdot (X + B) \tag{169}$$

One formula

$$A_i = \pm (b_o^{\ 2} - a_o^{\ 2})$$

is realized at a concrete endless series five forms :

$$\left.\begin{array}{l} A^*{}_1 = (b_o^{\ 2} - a_o^{\ 2}) \ \text{ if } b_o > a_o \\ A^*{}_2 = (a_o^{\ 2} - b_o^{\ 2}) \ \text{ if } a_o > b_o \\ A^*{}_3 = (b_o - a_o) \ \text{ if } b_o > a_o \\ A^*{}_4 = (a_o - b_o) \ \text{ if } a_o > b_o \\ A^*{}_5 = c_o \end{array}\right\} \tag{170}$$

as basis for three Rule – Rule № A , Rule № B and Rule № C.

The infinite system equations

$$Y^2 = a_o^{\ n} \cdot b_o^{\ n} \cdot c_o^{\ n} = (a_o \cdot b_o \cdot c_o)^n \tag{171}$$

is realized at a concrete exponent of power n and at a concrete substitutions:

$$\left.\begin{array}{l} (X - A) = a_o^{\ n} \\ X = b_o^{\ n} \\ (X + B) = c_o^{\ n} \end{array}\right\} \tag{172}$$

where the number of the generalized variables is finite :

$$\left.\begin{array}{l} a_o = v^2 - u^2 \\ b_o = 2v \cdot u \\ c_o = v^2 + u^2 \end{array}\right\} \tag{173}$$

Further on, Hilbert's question is verbalized as follows:
«At which conditions exist the finite system of the forms through which all others are expressed as the linear combinations are the integral rational functions of the same variables?"

In our case, use is made of three form:

$$(A^*_i - A^*_{i-1}) = 2 \cdot \lambda_2 = 2 \cdot 2 = 4 \qquad (174)$$

$$(A^*_i - A^*_{i-1}) = 3 \cdot \lambda_2 = 3 \cdot 2 = 6 \qquad (175)$$

$$(A^*_i - A^*_{i-1}) = 4 \cdot \lambda_2 = 4 \cdot 2 = 8 \qquad (176)$$

The integral functions of the variables, appeared to be the intervals:

$$2, 3, 5, 7 \qquad (177)$$

which realized to possess properties of the endless series prime numbers, see (205) and Table № 1.
It is fundamental intervals between prime numbers.

Attention !

The second fundamental «nucleus» of natural numbers:

$$J_7 = 1, 2, 3, 4, 5, 6, 7 \qquad (178)$$

contains three even numbers:

$$2, 4, 5, 6, 7 \qquad (179)$$

which size up of the principal intervals between prime numbers , see (205) and Table № 1.

8.New zeta functions and new substitutes for Frey's equation

8.1 New zeta functions

$$\zeta^*(5) = \frac{1}{5 \cdot \ln 1} + \frac{1}{5 \cdot \ln 2} + \frac{1}{5 \cdot \ln 3} + \frac{1}{5 \cdot \ln 4} + ... = \\ = \frac{1}{5} \cdot \left(\frac{1}{\ln 1} + \frac{1}{\ln 2} + \frac{1}{\ln 3} + \frac{1}{\ln 4} + ...\right) = \frac{1}{5} \cdot R^* \qquad (180)$$

$$\zeta^*(7) = \frac{1}{7 \cdot \ln 1} + \frac{1}{7 \cdot \ln 2} + \frac{1}{7 \cdot \ln 3} + \frac{1}{7 \cdot \ln 4} + ... = \\ = \frac{1}{7} \cdot \left(\frac{1}{\ln 1} + \frac{1}{\ln 2} + \frac{1}{\ln 3} + \frac{1}{\ln 4} + ...\right) = \frac{1}{7} \cdot R^* \qquad (181)$$

From the form (180) the spectral structure of number 5 follows:

$$5 = \frac{R^*}{\xi^*(5)} \qquad (182)$$

and from the form (181) the spectral structure of number 7 follows:

$$7 = \frac{R^*}{\xi^*\ (7)} \qquad (183)$$

Number 5 closest fit the first fundamental «nucleus» of natural numbers:

$$J_5 = 1,2,3,4,5 \qquad (184)$$

Number 7 closest fit the second fundamental «nucleus» of natural numbers:

$$J_7 = 1,2,3,4,5,6,7 \qquad (185)$$

First two numbers of both «nucleus» are put by Diophantine in a basis of this algorithm of calculation of first primitive triads of Pythagorean. Primitive Pythagorean triads, which according to [2] are determined the following way (repetitive activity):

If whole numbers v and u are such, that

$$v > u > 0 \qquad (186)$$

and Greatest Common Divisor-

GCD (v,u) =1, **(187)**

at a v>u of different evenly, than triads (a_0, b_0, c_0), given by equations:

$$\left.\begin{aligned} a_0 &= v^2 - u^2 \\ b_0 &= 2v \cdot u \\ c_0 &= v^2 + u^2 \end{aligned}\right\} \qquad (188)$$

are primitive solutions of the equation :

$$a_0{}^2 + b_0{}^2 = c_0{}^2 \qquad (189)$$

8.2 New substitutes for Frey's equation

Author propose for Frey's equation:

$$Y^2 = (X - A) \cdot X \cdot (X + B) \qquad (190)$$

new features and new forms:

$$
\left.\begin{aligned}
&Y^2 = [b_o{}^n - (X - a_o{}^n)] \cdot b_o{}^n \cdot (a_o{}^n + b_o{}^n) = \\
&= a_o{}^n \cdot b_o{}^n \cdot (a_o{}^n + b_o{}^n) = a_o{}^n \cdot b_o{}^n \cdot c_o{}^n, \;\; n \to \infty \\
&Y^2 = [b_o{}^2 - (X - a_o{}^2)] \cdot b_o{}^2 \cdot (a_o{}^2 + b_o{}^2) = \\
&= a_o{}^2 \cdot b_o{}^2 \cdot c_o{}^2 \;\;, \;\; n = 2
\end{aligned}\right\} \tag{191}
$$

The new features of the following substitutes:

$$
\left.\begin{aligned}
&(X - A) = a_o{}^n \\
&X = b_o{}^n \\
&(X + B) = c_o{}^n
\end{aligned}\right\} \tag{192}
$$

as link between Fermat's equation and of new Frey's equation (190).

Attention !

Equations (191) contains element:

$$
c_o{}^n = a_o{}^n + b_o{}^n = c_o{}^n \tag{193}
$$

as special form of the Fermat's equation

Mentioned above general formula (167), gave follows a determination of endless series numbers:

$$
A^*{}_n = \pm\,(b_o{}^2 - a_o{}^2) = \pm\,(b_o - a_o) \cdot (b_o + a_o) \tag{194}
$$

Formula (194) lets calculate infinite number of pairs for prime-numbers
because of natural resolution of difference of squares:

$$
\pm\,(b_o{}^2 - a_o{}^2) = \pm(b_o - a_o) \cdot (b_o + a_o) \tag{195}
$$

of endless series prime–numbers:

$$
\left.\begin{aligned}
&A^*{}_1 = (b_o{}^2 - a_o{}^2) \;\text{ if }\; b_o > a_o \\
&A^*{}_2 = (a_o{}^2 - b_o{}^2) \;\text{ if }\; a_o > b_o \\
&A^*{}_3 = (b_o - a_o) \;\text{ if }\; b_o > a_o \\
&A^*{}_4 = (a_o - b_o) \;\text{ if }\; a_o > b_o \\
&A^*{}_5 = c_o
\end{aligned}\right\} \tag{196}
$$

For correct using these formulas it is necessary to three rules, which are described below .
Accounting for determination (188), forms (196) take the following «genuine» forms:

$$\left.\begin{array}{ll} A^*{}_1 = [(2vu)^2 - (v^2 - u^2)^2] & \text{if } 2vu > (v^2 - u^2 \\ A^*{}_2 = [(v^2 - u^2)^2 - (2vu)^2] & \text{if } (v^2 - u^2) > 2vu \\ A^*{}_3 = [(2vu) - (v^2 - u^2)] & \text{if } 2vu > (v^2 - u^2) \\ A^*{}_4 = [(v^2 - u^2) - (2vu)] & \text{if } (v^2 - u^2) > 2vu \\ A^*{}_5 = (v^2 + u^2) & \end{array}\right\} \quad (197)$$

Authors algorithm propagates to all infinite set of primitive triads of Pythagorean, see (188) ,which are formed from natural numbers, see (186) . Numbers 2, 3 . 5 and 7 carry out a role of controllers in algorithm of exarticulation of prime– numbers, see (205) and Table № 1 , from endless lines of numbers natural:

$$N = 1,2,3,4,5,6,7,8,.... \quad (198)$$

9. Equation of G.Frey a key to proof of the Riemann's Hypothesis.

Equation of G.Frey, takes a wide specter of formerly unknown features, if we use substitutions, mathematically constructed from primitive triads of Pythagorean. Author described for Frey's equation:

$$Y^2 = (X - A) \cdot X \cdot (X + B) \quad (199)$$

the features of the following substitutes, see (192):

$$\left.\begin{array}{l} (X - A) = a_o{}^n \\ X = b_o{}^n \\ (X + B) = c_o{}^n \end{array}\right\} \quad (200)$$

These substitutes let be discover existence of infinite numbers of non-modular elliptical curves. In result was proved falseness of hypothesis by G.Shimura and Y.Taniyama, .
This fact made doubtful correctness of proof of the Last Theorem of P.Fermat , offered by Dr. A.Wiles A . [3].

9.Together with this mathematical discovery author found

out that substitutes transform G.Frey equation.

Transform G.Frey equation into the following equation:

$$Y^2 = a_0{}^n \cdot b_0{}^n \cdot c_0{}^n = (a_0 \cdot b_0 \cdot c_0)^n \tag{201}$$

which at $n = 2$ find elementary form:

$$Y^2 = a_0{}^2 \cdot b_0{}^2 \cdot c_0{}^2 = (a_0 \cdot b_0 \cdot c_0)^2 \tag{202}$$

This form I've got links the world of the primitive Pythagorean triplets, world natural and prime numbers through Pythagorean equation:

$$a_0{}^2 + b_0{}^2 = c_0{}^2 \tag{203}$$

and through complex function or general invariant, see (74):

$$S = s \cdot s^* = (a_0 + i \cdot b_0) \cdot (a_0 - i \cdot b_0) = a_0{}^2 + b_0{}^2 = c_0{}^2 \tag{204}$$

All prime– numbers settle down in a natural line in pairs, general intervals between which submit to a rhythm of numbers 2 , 3 , 5 and 7:

$$\left.\begin{array}{lllll}
2-1=1 & 19-17=2 & 53-47=2\cdot 3 & 87-83=2^2 & 111-109=2 \\
3-2=1 & 23-19=2^2 & 61-53=2^3 & 89-87=2 & 113-111=2 \\
5-3=2 & 31-23=2^3 & 63-61=2 & 97-89=2^3 & 117-113=2^2 \\
7-5=2 & 37-31=2\cdot 3 & 71-63=2^2 & 101-97=2^2 & 127-117=2\cdot 5 \\
11-7=2^2 & 41-37=2^2 & 73-71=2 & 103-101=2 & 131-117=2\cdot 7 \\
13-11=2 & 43-41=2 & 79-73=2\cdot 3 & 107-103=2^2 & 131-127=2^2 \\
17-13=2^2 & 47-43=2^2 & 83-79=2^2 & 109-107=2 & 137-131=2\cdot 3
\end{array}\right\} \tag{205}$$

Formulas of Germain S, [2] , chapt.4 , part 4.3:

$$\left.\begin{array}{l}
q-1=2p\cdot k \quad \text{If} \\
(2k)^{2k} \neq 1 \pmod q \\
p^{2k} \neq 1 \pmod q
\end{array}\right\} \tag{206}$$

See a summary Table № 1 as confirmation (206).

Notice: in 1970 Yu. V. Matiyasevich solve of Hilbert's tenth problem is unsolvable,

i.e., there is no general method for determining when such equations have a solution in whole numbers. Rule № A,
Rule № B and Rule № C for separate and calculate endless series prime-numbers is adequate interpretation conclusion of Matiyasevich, who has proved 10-th problem of D.Hilbert, proves to be true:
All prime numbers are simple search (recalculation) of all of some natural numbers.
However, Table № 1 for lack of numbers 101, 107, 119 et cetera, confer (205) and Table № 1.

Table № 1

P	q	h
3	7 = 2 x 3 + 1	3
5	11 = 2 x 5 + 1	2
7	29 = 4 x 7 + 1	2
11	23 = 2 x 11 + 1	5
13	5 3 = 4 x 13 +1	2
17	137 = 8 x 17 +1	3
19	191 = 10 x 19 +1	19
23	47 = 2 x 23 + 1	5
29	59 = 2 x 29 + 1	2
31	311 = 10 x 31 +1	17
37	149 = 4 x 37 +1	2
41	83 = 2 x 41 + 1	2
43	173 = 4 x 43 + 1	2
47	659 = 14 x 47 +1	2
53	107 = 2 x 53 +1	2
59	827 =14 x 59 +1	2
61	977 = 16 x 61 +1	3
67	269 = 4 x 67 +1	2
71	569 = 8 x 71 +1	3
73	293 = 4 x 73 +1	2
79	317 = 4 x 79 +1	2
83	167 = 2 x 83 + 1	5
89	179 = 2 x 89 +1	2
97	389 = 4 x 97 +1	2

All differences between the next simple numbers are subordinated to the law of formation
first fundamental «nucleus» of natural numbers (184) , second fundamental «nucleus» of natural numbers (178) and
of spectral invariant :

$$\lambda_2 = (2^0 + 2^{-1} + 2^{-2} + 2^{-3} + ... + 2^{-\alpha} + ... + 2^{-\infty}) \to 2 \tag{207}$$

As result - system following spectral forms:

$$(A^*{}_i - A^*{}_{i-1}) = \lambda_2 \quad \text{or} \quad (A^*{}_i - A^*{}_{i-1}) = \lambda_2 \tag{208}$$

$$(A^*_i - A^*_{i-1}) = 2 \cdot \lambda_2 \tag{209}$$

$$(A^*_i - A^*_{i-1}) = 3 \cdot \lambda_2 \tag{210}$$

$$(A^*_i - A^*_{i-1}) = 4 \cdot \lambda_2 \tag{211}$$

10. 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:

$$\zeta(s) = 1 + 1/2s + 1/3s + 1/4s + ... \tag{212}$$

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 1,500,000,000 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.

11. New forms for computations all primes numbers A^*_i

Exist five forms
for separation endless series prime numbers,
see below:

$$\left.\begin{array}{l} A^*_1 = (b_0^2 - a_0^2) \text{ if } b_0 > a_0 \\ A^*_2 = (a_0^2 - b_0^2) \text{ if } a_0 > b_0 \\ A^*_3 = (b_0 - a_0) \text{ if } b_0 > a_0 \\ A^*_4 = (a_0 - b_0) \text{ if } a_0 > b_0 \\ A^*_5 = c_0 \end{array}\right\} \tag{213}$$

Here every number from endless series prime numbers

$$A^*_1 = (\ b_0^2 - a_0^2) \text{ if } b_0 > a_0 \tag{214}$$

without exception will not divide into

$$16 = 4 \times (b_o = 2vu) =$$
$$4 \times (b_o = 2 \times 2 \times 1) = \tag{215}$$
$$= (2^2)^2 = (\lambda_2{}^2)^2$$

If even integer

$$16 = \frac{(a_o \cdot b_o \cdot c_o)^{4n}}{\Delta^2} \tag{216}$$

is function a discriminant new elliptic curves, see (191) and [2] :

$$\Delta = \frac{(a_o \cdot b_o \cdot c_o)^{2n}}{2^8} \tag{217}$$

At the same time $A = (b_o{}^2 - a_o{}^2)$ without exception will not divide

$$27 = 9 \times (a_0 = v^2 - u^2) =$$
$$= 9 \times (a_o = 2^2 - 1^2) = \tag{218}$$
$$= 3^3$$

if odd number 27 is equivalent:

$$27 = -\left(\frac{\Delta + 4a_o{}^3}{b_o{}^2}\right) \tag{219}$$

where

$$\Delta = -\left(4a_o{}^3 + \frac{27}{b_o{}^2}\right) \tag{220}$$

discriminant for canonical form any new elliptic curves:

$$Y^2 = x^3 + a_o \cdot x + b_o \tag{221}$$

Endless series prime numbers:

$$A^*{}_1 = (b_o{}^2 - a_o{}^2) \text{ if } b_o > a_o \tag{222}$$

is endless series of conductors-criterions for separation non- modular elliptic curves.
Number 2 end number 3 were invariant , along with 5 and 7 , from endless series prime numbers, see (205) and Table №1 .
All prime– numbers settle down in a natural line in pairs, mainly intervals between which submit toa rhythm mainly of numbers v=2 and

$$a_o = (v^2 - u^2) = (2^2 - 1^2) = 3 \tag{223}$$

All differences between the next simple numbers are subordinated to the law of formation of primes-numbers and spectral invariant, see (208)-(211) .

Attention!

A^*_1 and A (224)

are isogenous abelian varieties

Rule № A, Rule № B and Rule № C for separate and calculate endless series prime-numbers is adequate interpretation conclusion of Matiyasevich, who has proved 10-th problem of D.Hilbert , proves to be true ((repetitive activity):

All prime numbers are simple search (recalculation)
of all of some natural numbers.

Three forms of Rules, in according to conception by D.Hilbert, [10] and [11], creates expansion endless series forms, The forms contains spectral invariant λ_2, see (207) , invariant $5 = \frac{R^*}{\zeta^*(5)}$, see (182), invariant $7 = \frac{R^*}{\zeta^*(7)}$, see (183) ,

as well as general invariant – complex function :

$$S = s \cdot s^* = (a_0 + i \cdot b_0) \cdot (a_0 - i \cdot b_0) = a_0{}^2 + b_0{}^2 = c_0{}^2 \tag{225}$$

Complex function S is basis for calculations of general complex zeta function:

$$\begin{aligned} S^* &= s \cdot s^* = (a_0 + i \cdot b_0) \cdot (a_0 - i \cdot b_0) = \\ &= a_0{}^2 = 1 \end{aligned} \tag{226}$$

what, see Pic.2 and Pic.10 :

$$\left.\begin{aligned} &Q = \pi \\ &a_o = v^2 - u^2 = 1 \\ &b_o = 2vu = 0 \end{aligned}\right\} \tag{227}$$

where v=1 and u=0 taken from:

$$\begin{cases} v = 1,2,3,4,5,... \\ u = 0,1,2,3,4,5,... \end{cases} \tag{228}$$

Out of formula (225) follow new complex function :

$$S^*{}_0 = s \cdot s^* = (a_0 + i \cdot b_0) \cdot (a_0 - i \cdot b_0) = b_0{}^2 = 0 \tag{229}$$

because:

$$b_o = 2vu = 0 \tag{230}$$

where v=1 and u=0 taken from (228).

Complex function (225) is argument for zeta function

$$\zeta(S) = 2^S \pi^{S-1} \sin\frac{\pi S}{2}\,\Gamma(1-S)\,\zeta(1-S) \tag{231}$$

as well as for new (simple) zeta function:

$$\zeta(S) = 2^S \cdot \sin\left(\frac{Q \cdot S}{n}\right) \tag{232}$$

Here Q variable quantity of angle, see Pic.1 , Pic.2:, Pic.9 , Pic.10, Pic, 11 :

$$0 \le Q \le \pi \tag{233}$$

and

$$n = N = 1, 2, 3, 4, 5, \ldots \tag{234}$$

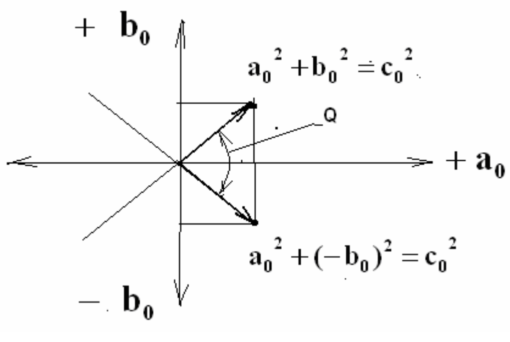
Remark: G.F.B. Riemann (1826 – 1866) observed that the frequency of prime numbers is very closely related to the behavior of an elaboration function:

$$\zeta(s) = 1 + 1/2^5 + 1/3^5 + 4/4^5 + + \ldots \tag{235}$$

called the Riemann Zeta function»
See: http://www.claymath.org/millennium.) ,
But, be in existence other zeta functions, see (180) and (181).

11. 1 Special systems a coordinates
and special general invariant

"System A" coordinates
for whole primitive Pythagorean numbers ,



Pic.4

This is orthogonal system coordinate for primitive Pythagorean triads:

$$\left.\begin{aligned} a_0 &= v^2 - u^2 \\ b_0 &= 2vu \\ c_0 &= v^2 + u^2 \end{aligned}\right\} \qquad (236)$$

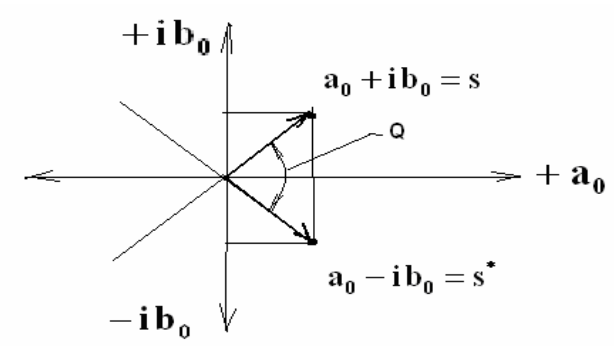
for all pair v>u numbers are the numbers of various evenness taken from endless series :

$$\begin{aligned} u &= 0, 1, 2, 3, 4, ,.... \\ v &= (u+1) = 1, 2, 3, 4, ... \end{aligned} \qquad (237)$$

Consequence

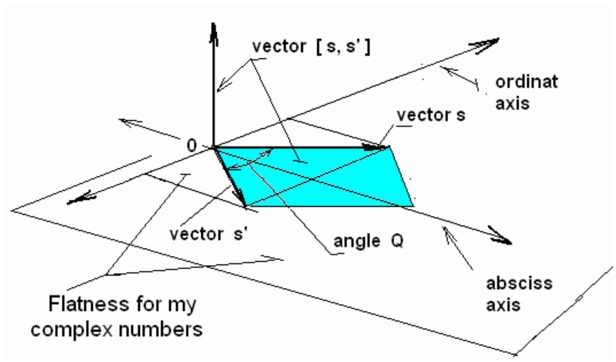
$$\left.\begin{aligned} u &= \sqrt{v^2 - a_o} = \frac{b_o}{2v} = \sqrt{c_o - v^2} \\ v &= \sqrt{a_o + u^2} = \frac{b_o}{2u} = \sqrt{c_o - u^2} \end{aligned}\right\} \qquad (238)$$

"System B" coordinates for complex numbers , see Pic.1



Pic.1

Geometrical interpretation a vector product for "System B" , see Pic,2



Pic.2

Here we create a product as complex function:

$$S = s \cdot s^* = (a_0 + i \cdot b_0) \cdot (a_0 - i \cdot b_0) = \\ = a_0{}^2 + b_0{}^2 = c^2 \qquad (239)$$

It is general common mathematical invariant for systems "A" and "B"

as Complex function over field N of natural numbers $v > u$

Other, we create a vector product:

$$\left[s, s^* \right] \qquad (240)$$

and vector's length :

$$\left| S \right| = \left| s, s^* \right| = \left| s \right| \cdot \left| s^* \right| \cdot \sin Q \qquad (241)$$

as argument for Riemann's equations:

$$\zeta(S) = 2^S \cdot \pi^{S-1} \cdot \sin \frac{\pi S}{2} \cdot \Gamma(1 - S) \cdot \zeta(1 - S) \qquad (242)$$

Author propose following research result a Riemann's statements.

11.2 Riemann's statement № 1

Function:

$$\zeta(s) = 2^s \cdot \pi^{s-1} \cdot \sin \frac{\pi s}{2} \cdot \Gamma(1 - s) \cdot \zeta(1 - s) \neq 1 \qquad (243)$$

determines all complex numbers $s \neq 1$

11.3 New statement № 1

Function:

$$\zeta(s) = 2^s \cdot \pi^{s-1} \cdot \sin\frac{\pi s}{2} \cdot \Gamma(1-s) \cdot \zeta(1-s) \neq 1 \tag{244}$$

determines all complex numbers $s \neq 1$ if, see Pic.2, Pic.10 and Pic.11 :

$$0 < Q < 2\pi \tag{245}$$

at the same time endless series complex functions

$$\begin{aligned} S &= s \cdot s^* = (a_0 + i \cdot b_0) \cdot (a_0 - i \cdot b_0) = \\ &= a_0{}^2 + b_0{}^2 = c_0{}^2 \neq 1 \end{aligned} \tag{246}$$

where equations:

$$\left.\begin{aligned} a_o &= v^2 - u^2 \\ b_o &= 2vu \\ c_o &= v^2 + u^2 \\ a_o{}^2 + b_o{}^2 &= c_o{}^2 \end{aligned}\right\} \tag{247}$$

from endless series of natural numbers N= 1, 2, 3, 4, 5,…..
realize for all pairs number $v > u$ of various evenness, taken

N o t i c e

$$\begin{aligned} S^* &= s \cdot s^* = (a_0 + i \cdot b_0) \cdot (a_0 - i \cdot b_0) = \\ &= a_0{}^2 = 1 \end{aligned} \tag{248}$$

what

$$\left.\begin{aligned} Q &= \pi \\ a_o &= v^2 - u^2 = 1 \\ b_o &= 2vu = 0 \end{aligned}\right\} \tag{249}$$

where v=1 and u=0 taken from:

$$\begin{cases} v = 1, 2, 3, 4, 5, \ldots \\ u = 0, 1, 2, 3, 4, 5, \ldots \end{cases} \tag{250}$$

11,4 Riemann's statement № 2

Z(s) function determines the zeros for

$$s = -2, \; -4, \; -6, ... \qquad (251)$$

11,5 New statement № 2

$$Z(S \;) = \operatorname{Sin} Q \cdot S^* = 0 \qquad (252)$$

function determines endless series zeros

$$b_o = 0 \qquad (253)$$

for

$$S = -2 \cdot S^*, \; -4 \cdot S^*, \; -6 \cdot S^*, ... \qquad (254)$$

If angle Q=0 , see Pic.1 , Pic. 2 and Pic,10 , then:

$$\left.\begin{aligned} +i \cdot b_o = 0 \\ -i \cdot b_o = 0 \end{aligned}\right\} \qquad (255)$$

$$\begin{aligned} S^* = s \cdot s^* = (a_o + i \cdot b_o) \cdot (a_o - i \cdot b_o) = \\ = a_o{}^2 = 1 \end{aligned} \qquad (256)$$

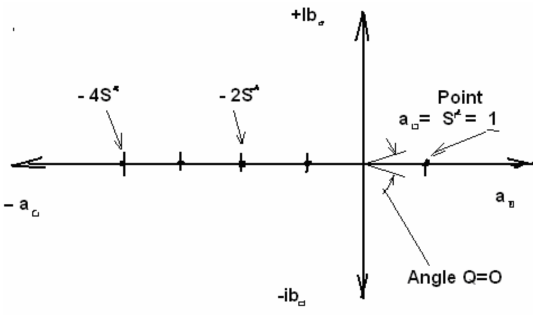
what

$$\left.\begin{aligned} a_o = v^2 - u^2 = 1 \\ b_o = 2 \cdot v \cdot u = 0 \\ c_o = v^2 + u^2 = 1 \\ a_o{}^2 + b_o{}^2 = c_o{}^2 = 1 \end{aligned}\right\} \qquad (257)$$

where v=1 and u=0 taken from:

$$\begin{cases} v = 1, 2, 3, 4, 5, ... \\ u = 0, 1, 2, 3, 4, 5, ... \end{cases} \qquad (258)$$

Geometrical interpretation to formulas (254)-(256), see Pic 5:



Pic. 5

11.6 Riemann's statement № 3

Forma:

$$\frac{1}{\zeta(s)} = \sum_{n=1}^{\infty} \frac{\mu(n)}{n^s} \tag{259}$$

determines stripe

$$0 \le R(s) \le 1 \tag{260}$$

for all 'untrivial zeros', when

$$\frac{1}{2} + i \cdot t \ , \ t \in R \tag{261}$$

11.7 New statement № 3

Let $2 \cdot S^* = \lambda_2$ **where:** **(262)**

$$\lambda_2 = 2^0 + 2^{-1} + 2^{-2} + 2^{-3} + ... + 2^n + ... \ \to 2 \ \text{if} \ n \to \infty \tag{263}$$

then:

$$\left.\begin{aligned} &\lambda_2 = 1 + \Delta\lambda_2 \ . \\ &\Delta\lambda_2 = 2^{-1} + 2^{-2} + 2^{-3} + ... + 2^n + ... \ \to 1 \ \ \text{if} \ n \to \infty \end{aligned}\right\} \tag{264}$$

where:

$$\Delta\lambda_2 = \frac{1}{2} + r \tag{265}$$

and

$$r = 2^{-2} + 2^{-3} + ... + 2^{-n} + ... \ \to 0.5 \ \ \text{if} \ n \to \infty \tag{266}$$

Forma:

$$\frac{1}{\zeta(s)} = \sum_{n=1}^{\infty} \frac{\mu(n)}{n^s} \qquad (267)$$

determines stripe

$$0 \le R(s) \le 1 \qquad (268)$$

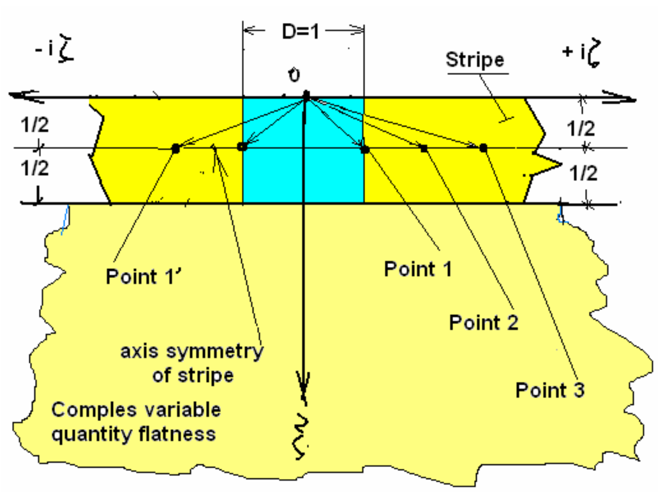
for all 'untrivial zeros', when

$$\frac{1}{2} + i \cdot r \ \ , \ \ r \in R \qquad (269)$$

as equivalent:

$$\frac{1}{2} + i \cdot \zeta \ , \ \zeta \in R \qquad (270)$$

, see Pic.6 :



Pic.6

where:

$$\left.\begin{aligned}
&\text{Point1} \Rightarrow \quad z = (\xi + i\cdot\zeta) = \left(\frac{1}{2} + i\cdot 0.5\right)\\
&\text{Point2} \Rightarrow \quad z = (\xi + i\cdot\zeta) = \left(\frac{1}{2} + i\cdot 1\right)\\
&\text{Point3} \Rightarrow \quad z = (\xi + i\cdot\zeta) = \left(\frac{1}{2} + i\cdot 1.5\right)\\
&\dots\dots\dots\dots\\
&\text{Point } 1' \Rightarrow \quad z' = (\xi - i\cdot\zeta) = \left(\frac{1}{2} - i\cdot 0.5\right)\\
&\text{Point} 2' \Rightarrow \quad z' = (\xi - i\cdot\zeta) = \left(\frac{1}{2} - i\cdot 1\right)\\
&\text{Point} 3' \Rightarrow \quad z' = (\xi - i\cdot\zeta) = \left(\frac{1}{2} - i\cdot 1.5\right)\\
&\dots\dots\dots\dots
\end{aligned}\right\} \tag{271}$$

Result

Forma:

$$\frac{1}{\zeta(s)} = \sum_{n=1}^{\infty}\frac{\mu(n)}{n^s} \tag{272}$$

determines stripe, see Pic.6 :

$$\left.\begin{aligned} 0 \le R(z) \le 1\\ 0 \le R(z') \le 1 \end{aligned}\right\} \tag{273}$$

for all 'untrivial zeros', see Pic.1 – Pic.8.

when, angle $Q = \pi \quad \Rightarrow \quad a_o = 0$

That is many-valued transformation.

Zeta function:

$$\zeta(S^*_0) = 2^{S^*_0}\cdot\pi^{S^*_0 - 1}\cdot\sin\frac{Q\cdot S^*_0}{2}\cdot\Gamma(1 - S^*_0)\cdot\zeta(1 - S^*_0) = 0$$

(274)

and complex function :

$$S^*{}_0 = s \cdot s^* = (a_0 + i \cdot b_0) \cdot (a_0 - i \cdot b_0) = b_0{}^2 = 0 \tag{275}$$

are zero because local primitive number of Pythagorean:

$$b_o = 2vu = 0 \tag{276}$$

where v=1 and u=0 taken from:

$$\begin{cases} v = 1, 2, 3, 4, 5, ... \\ u = 0, 1, 2, 3, 4, 5, ... \end{cases} \tag{277}$$

and $\sin\frac{Q \cdot S^*{}_0}{2} = 0$ **because** $S^*{}_0 = 0$**, see (275).**

11.8 Consequently, be in existence endless series complex numbers as endless series of zeros:

$$\left.\begin{aligned} z &= \xi + i \cdot \zeta \Rightarrow (a_o + i \cdot b_o) = 0 \\ z' &= \xi - i \cdot \zeta \Rightarrow (a_o - i \cdot b_o) = 0 \end{aligned}\right\} \tag{278}$$

At the same time be in existence complex function:

$$\frac{1}{\zeta(S^*)} = \sum_{n=1}^{\infty} \frac{\mu(n)}{n^{S^*}} \to 0 \tag{279}$$

which halt spectral function:

$$\mu(n) = \Delta\lambda_2 = 2^{-1} + 2^{-2} + 2^{-3} + ... + 2^{-n} + ... \Rightarrow 1 \text{ if } n \to \infty \tag{280}$$

and complex functions:

$$\begin{aligned} S^*{}_1 &= s \cdot s^* = (a_0 + i \cdot b_0) \cdot (a_0 - i \cdot b_0) = \\ &= a_0{}^2 = 1 \end{aligned} \tag{281}$$

what contains local value of primitive numbers of Pithagorean :

$$\begin{aligned} a_o &= v^2 - u^2 = 1 \\ b_o &= 2vu = 0 \end{aligned} \tag{282}$$

where v=1 and u=0 taken from:

$$\begin{cases} v = 1, 2, 3, 4, 5, ... \\ u = 0, 1, 2, 3, 4, 5, ... \end{cases} \tag{283}$$

Attention: $S^* \geq S^*{}_1$ **and** $S^*{}_0 = 0$

Consequently, determines special zeta function

$$\zeta(S^*{}_1) = \frac{1}{\sum\limits_{n=1}^{\infty} \frac{\mu(n)}{n^{S^*}} \to 0} = \frac{S^*{}_1}{\sum\limits_{n=1}^{\infty} \frac{\mu(n)}{n^{S^*}}} \quad \to \infty \tag{284}$$

as link between all primitive triplets of Pythagorean :

$$\left. \begin{aligned} a_o &= v^2 - u^2 \\ b_o &= 2vu \\ c_o &= v^2 + u^2 \\ a_o{}^2 + b_o{}^2 &= c_o{}^2 \end{aligned} \right\} \tag{285}$$

and complex functions:

$$S^* \to S^*{}_0 \quad \text{when} \quad Q \to 0 \tag{286}$$

In formula (284) :

$$\begin{aligned} S^*1 &= s \cdot s^* = (a_0 + i \cdot b_0) \cdot (a_0 - i \cdot b_0) = \\ &= a_0{}^2 = 1 \end{aligned} \tag{287}$$

At the same time:

$$\begin{aligned} S &= s \cdot s^* = (a_0 + i \cdot b_0) \cdot (a_0 - i \cdot b_0) = \\ &= a_0{}^2 + b_0{}^2 = c_0{}^2 \end{aligned} \tag{288}$$

complex functions over infinite rows natural numbers, see (285) :

$$\begin{cases} v = 1, 2, 3, 4, 5, ... \\ u = 0, 1, 2, 3, 4, 5, ... \end{cases} \tag{289}$$

12. Description Rule № A, Rule № B and Rule № C

12.1 Primitive Pythagorean triads, which halt a value prime's numbers by a rule № A

Rule № A . If $c_0 = A^*5$ **prim's–numbers, then according:**

$$\left.\begin{aligned}
&A^*1 = (b_0{}^2 - a_0{}^2) \ \text{ if } \ b_0 > a_0 \\
&A^*2 = (a_0{}^2 - b_0{}^2) \ \text{ if } \ a_0 > b_0 \\
&A^*3 = (b_0 - a_0) \ \text{ if } \ b_0 > a_0 \\
&A^*4 = (a_0 - b_0) \ \text{ if } \ a_0 > b_0 \\
&A^*5 = c_0
\end{aligned}\right\} \tag{290}$$

For $b_0 > a_0$ **, numbers**

$$A^*3 = (b_0 - a_0) \tag{291}$$

are prime's–numbers and

$$A^*1 = (b_0{}^2 - a_0{}^2) \tag{292}$$

are prime's–numbers or

$$(b_0{}^2 - a_0{}^2) \tag{293}$$

will divide by controller

$$7 = \frac{R^*}{\zeta^*\ (7)} \tag{294}$$

For $a_0 > b_0$ **, numbers**

$$A^*{}_4 = (a_o - b_o) \tag{295}$$

are prime's–numbers and

$$A^*{}_2 = (a_o{}^2 - b_o{}^2) \tag{296}$$

are prime's–numbers or

$$(b_o{}^2 - a_o{}^2) \tag{297}$$

will divide by controller

$$7 = \frac{R^*}{\zeta^*\ (7)} \tag{298}$$

12.2 Primitive Pythagorean triads , which halt a value prime's numbers by a rule № B

Rule № B

If controller

$$5 = \frac{R^*}{\zeta^*\ (5)} \tag{299}$$

divide numbers c_0 , then according :

$$\left.\begin{aligned} &A^*{}_1 = (b_o{}^2 - a_o{}^2)\ \text{ if }\ b_o > a_o \\ &A^*{}_2 = (a_o{}^2 - b_o{}^2)\ \text{ if }\ a_o > b_o \\ &A^*{}_3 = (b_o - a_o)\ \text{ if }\ b_o > a_o \\ &A^*{}_4 = (a_o - b_o)\ \text{ if }\ a_o > b_o \\ &A^*{}_5 = c_o \end{aligned}\right\} \tag{300}$$

For $b_o > a_o$, numbers

$$A^*{}_3 = (b_o - a_o) \tag{301}$$

$$A^*{}_1 = (b_o{}^2 - a_o{}^2) \tag{302}$$

are prime–numbers

For $a_0 > b_0$, numbers

$$A^*{}_4 = (a_0 - b_0) \tag{303}$$

$$A^*{}_2 = (a_0{}^2 - b_0{}^2) \tag{304}$$

are prime–numbers

12.3 Primitive Pythagorean triads, which halt a value prime's numbers by a rule № C

Rule № C

If controller

$$7^2 = \left(\frac{R^*}{\zeta^*(7)}\right)^2 \tag{305}$$

divide numbers

$$(b_0{}^2 - a_0{}^2) \tag{306}$$

and controller

$$7 = \frac{R^*}{\zeta^*\ (7)} \tag{307}$$

divide numbers

$$(b_0 - a_0) \tag{308}$$

then are

$$A^*{}_5 = c_0 \qquad \text{prime's–numbers} \tag{309}$$

12.4 Explanatory or demonstration examples for calculations of prime-numbers useful formulas:

$$\left.\begin{aligned} A^*{}_1 &= (b_o{}^2 - a_o{}^2) \text{ if } b_o > a_o \\ A^*{}_2 &= (a_o{}^2 - b_o{}^2) \text{ if } a_o > b_o \\ A^*{}_3 &= (b_o - a_o) \text{ if } b_o > a_o \\ A^*{}_4 &= (a_o - b_o) \text{ if } a_o > b_o \\ A^*{}_5 &= c_o \end{aligned}\right\} \qquad (310)$$

Let's take from the book [2], see chapter 1, part 1.1 , ready triads of primitive Pythagorean triads (b_o, a_o, c_o):

№1: (4,3,5)	№4: (12,5,13)	№7: (8,15,17)	№10: (24,7,25)	
№2: (20,21,29)	№5: (12,35,37)	№8: (40,9,41)	№11: (28,45,53)	(311)
№3: (60,11,61)	№6: (56,33,65)	№9: (16,63,65)	№12: (48,55,73)	

Substitute these numbers into my formulas and you will get a full set of prime-numbers, born by corresponding of following rules:

12.5 Primitive Pythagorean triads, which halt a value prime's numbers by a rule № A

Triad № 2 : **(312)**

$(a_o{}^2 - b_o{}^2) = 441 - 400 = 41$ **prime number**

$(a_o - b_o) = 21 - 20 = 1$ **prime number**

$A^*{}_5 = c_o = 29$ **prime number**

Triad № 4 : **(313)**

$(b_o{}^2 - a_o{}^2) = 144 - 25 = 119/7 = 17$ **prime number**

$(b_o - a_o) = 4 - 3 = 1$ **prime number**

$A^*5 = c_o = 13$ **prime number**

Triad № 5 : **(314)**

$(a_o{}^2 - b_o{}^2) = 1225 - 144 = 1081$ **prime number**

$(a_o - b_o) = 35 - 12 = 23$ **prime number**

$A^*5 = c_o = 37$ **prime number**

Triad № 7 : **(315)**

$(a_o{}^2 - b_o{}^2) = 225 - 64 = 161 / 7 = 23$ **prime number**

$(a_o - b_o) = 15 - 8 = 7$ **prime number**

$A^*5 = c_o = 17$ **prime number**

Triad № 8 : **(316)**

$(b_o{}^2 - a_o{}^2) = 1600 - 81 = 1519 / 7 = 217$ **prime number**

$(b_o - a_o) = 40 - 9 = 31$ **prime number**

$A^*5 = c_o = 41$ **prime number**

Triad № 12 : **(317)**

$(a_o{}^2 - b_o{}^2) = 3025 - 2304 = 721 / 7 = 103$ **prime number**

$(a_o - b_o) = 55 - 48 = 7$ **prime number**

$A^*5 = c_o = 73$ **prime number**

12.6 Primitive Pythagorean triads, which
halt a value prime's numbers by a rule № B

Triad № 6 : **(318)**

$$(c_o / 5) = 65 / 5 = 13$$ **prime number**

$$(b_o{}^2 - a_o{}^2) = 3136 - 1089 = 2047$$ **prime number**

$$(b_o - a_o) = 56 - 33 = 23$$ **prime number**

Triad № 9 : **(319)**

$$c_o / 5 = 65 / 5 = 13$$ **prime number**

$$(a_o{}^2 - b_o{}^2) = 3969 - 256 = 3713$$ **prime number**

$$(a_o - b_o) = 63 - 16 = 47$$ **prime number**

Triad № 10 : **(320)**

$$c_o / 5 = 25 / 5 = 5$$ **prime number**

$$(b_o{}^2 - a_o{}^2) = 576 - 49 = 527$$ **prime number**

$$(b_o - a_o) = 24 - 7 = 17$$ **prime number**

12.7 Primitive Pythagorean triplets, which
halt a prime's numbers by a Rule № C

Triads № 3 : **(321)**

If ccontroller

$$7^2 = \left(\frac{R^*}{\zeta^*(7)} \right)^2$$

divide number

$$(b_o{}^2 - a_o{}^2) = 3600 - 121 = 3479 / 49 = 71$$ prime number

and controller

$$7 = \frac{R^*}{\zeta^* \ (7)}$$

divide number

$$(b_o - a_o) = 60 - 11 = 49 / 7 = 7$$ prime number

then

$$A^*{}_5 = c_o = 61$$ prime number

12.8 The remainder example (322)

Triad № 13 :

If v=17 and u=14 , then according (236):

$$a_o = 93$$
$$b_o = 476$$
$$c_o = 485$$

$$(b_o{}^2 - a_o{}^2) = 226\ 576 - 8\ 689 = 217\ 927$$ prime number

$$(b_o - a_o) = (476 - 93) = 383$$ prime number

$$c_o / 5 = 97$$ prime number

It is Rule № B

Triad № 14 : (323)

If v=17 and u=12 , then according (236):

$$a_o = 145$$
$$b_o = 408$$
$$c_o = 433$$

$$(b_o{}^2 - a_o{}^2) = 166\ 464 - 21\ 025 = 145\ 439 / 7 = 20\ 777$$ prime number

$(b_o - a_o) = 408 - 145 = 263$ **prime number**

$A^*5 = c_o = 433$ **prime number**

It is Rule № A

Triad № 15 : **(324)**

If v=18 and u=11 , then according (236):

$a_o = 203$

$b_o = 396$

$c_o = 445$

$(b_o^2 - a_o^2) = 156\,816 - 41\,209 = 115\,607$ **prime number**

$(b_o - a_o) = 396 - 203 = 193$ **prime number**

$A^*5 = c_o / 5 = 89$ **prime number**

It is Rule № B

Triad № 16 :

(325)

If v=18 and u=13 , then according (236):

$a_o = 155$

$b_o = 468$

$c_o = 493$

$(b_o^2 - a_o^2) = 219\,024 - 24\,025 = 194\,999 / 7 = 27\,857$ **prime number**

$(b_o - a_o) = 468 - 155 = 313$ **prime number**

$A^*5 = c_o = 493$ **prime number**

It is Rule № A

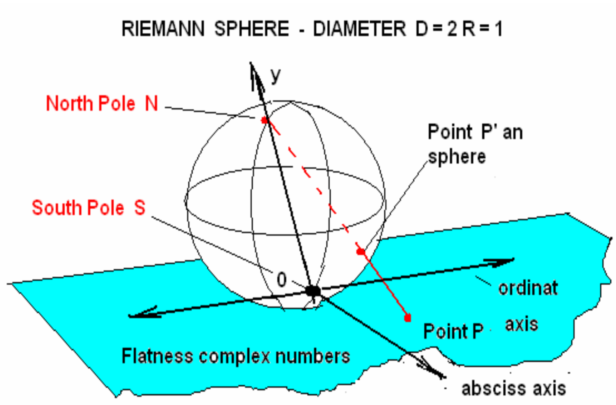
Et cetera, et cetera ….

13. Riemann's sphere as mapping of space task common solutions Riemann's Hypothesis and Birch and Swinnerton-Dyer Conjecture

13.1 Riemann's sphere

Complex number $s = a_0 + ib_0$, see Pic.1, Pic.5 – Pic.9, is set on a plane (ξ,ζ), see Pic.7 and Pic.8, by a point $P(a_o, b_o)$ the point $P'(\xi,\zeta,Y)$ of crossing of a piece PN of a straight line, with a surface of Riemann's sphere is a new geometrical representation of number $s = a_o + ib_o$ in the Descartes system of coordinates $(\xi,\zeta\ Y)$, see (326) . All complex numbers $s = a_o + ib_o$ and, see Pic.1-Pic.9 , are displayed by points which projections to a plane of complex numbers $z = \xi + i\zeta$ and $z' = \xi - i\zeta$.
Vectors $s = a_o - ib_o$ lay inside of a semicircle of diameter, see Pic.9.

In a Pic.6, Pic.7, Pic. 8 and Pic.9 it is presented behaviors of Riemann's sphere.
In a Pic.8 presented diametrical section of Riemann's sphere.
Thus:



Pic. 7

Here :

Flatness (ξ,ζ) for complex numbers $z = \xi + i\zeta$ and $z' = \xi - i\zeta$;
Point $P = P(a_o, b_o)$; Point $P' = P'(\xi,\zeta,Y)$;
Axis abscissa for ξ ; Axis ordinate for ζ ;
It is stereographical projection flatness (ξ,ζ) to sphere (ξ,ζ,Y)

Author propose following formulas for description a coordinates every points P' an Riemann's sphere, see Pic.7, as functions of primitive triplets of Pythagorean:

$$\left.\begin{aligned} \xi &= \frac{a_0}{1+a_0{}^2+b_0{}^2} = \frac{a_0}{1+c_0{}^2} \\ \zeta &= \frac{b_0}{1+a_0{}^2+b_0{}^2} = \frac{b_0}{1+c_0{}^2} \\ y &= \frac{a_0{}^2+b_0{}^2}{1+a_0{}^2+b_0{}^2} = \frac{c_0{}^2}{1+c_0{}^2} \end{aligned}\right\} \qquad (326)$$

In a Pic.8 it is presented diametrical section of Riemann's sphere, where two the character points P' an sphere have two the complex functions accordingly:

$$z = \xi + i \cdot \zeta = 0 + i \cdot 0.5\,, \quad Re(z) = 0 \qquad (327)$$

and

$$z = \xi + i \cdot \zeta = 0 + i \cdot 1\,, \qquad R(z) = 0 \qquad (328)$$

an flatness complex function.

If Point $P' = P'(\xi, \zeta, Y)$, see Pic.7, work for North Pole N, then all complex numbers

$z = \xi + i\zeta$ and $z' = \xi - i\zeta$ work for South Pole S.

At the same time, if

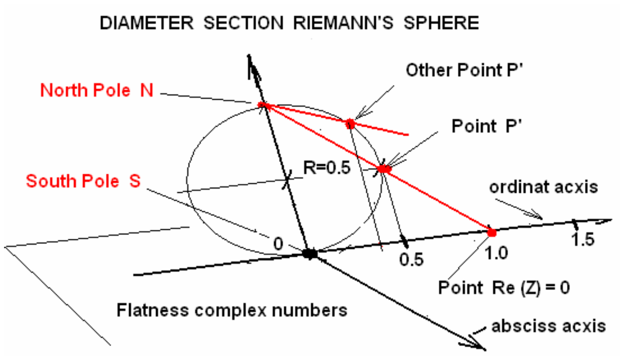
$$-\infty \le \zeta \le +\infty \qquad (329)$$

and

$$R(z) = 1/2 \qquad (330)$$

then bring about axis symmetry of stripe an flatness the complex functions, see Pic.9.

14. Comment for diameter section of Riemann's sphere



Pic. 8

If Point $P' = P'(\xi, \zeta, Y)$, see Pic.7, work for North Pole N,
then all complex numbers $z = \xi + i\zeta$ and $z' = \xi - i\zeta$ work for South Pole S.
In that case, endless series the complex functions:

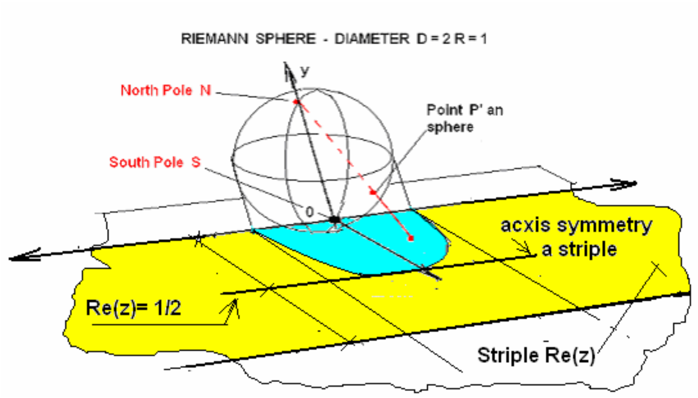
$$z = \xi + i\zeta \qquad (331)$$

and

$$z' = \xi - i\zeta \qquad (332)$$

derivable transformed in endless series zero.
According The Riemann hypothesis asserts that all interesting solutions of the equation $\zeta(s) = 0$, see (252) , (274) and (344), lie on a certain vertical straight line.

It is vertical, at the same time - coordinate $y \to 0$ according system (326) and according Pic.7 – Pic. 10.



Here stripe $0 \le Re(z) \le 1$

Pic.9

15. Concrete data for explanatory proofs

Variant data № 1 (333)

If angle $Q = \pi$, see Pic.1 , Pic.2 and Pic.10, then:

$$\left.\begin{array}{l} +ib_0 \to +\infty \\ -ib_0 \to -\infty \\ Re(s) = 0 \\ Re(s^*) = 0 \end{array}\right\} \qquad (334)$$

According we have endless series numbers:

$$\left|S\right| = \left|s \cdot s^*\right| = \left|a_o + ib_o\right| \cdot \left|a_o - ib_o\right| =$$
$$= \left|(a_o{}^2 + b_o{}^2\right| = \left|\ c_o{}^2\right| \tag{335}$$

as endless series primitive numbers of Pythagorean over field N natural numbers $(v > u)$:

$$c_o = \sqrt{\left|S\right|} = (v^2 + u^2) \tag{336}$$

In the end we have endless products, as endless series zeros:

$$\left|S\right| = \left|s, s^*\right| = \left|s\right| \cdot \left|s^*\right| \cdot \sin\ 0 = 0 \tag{337}$$

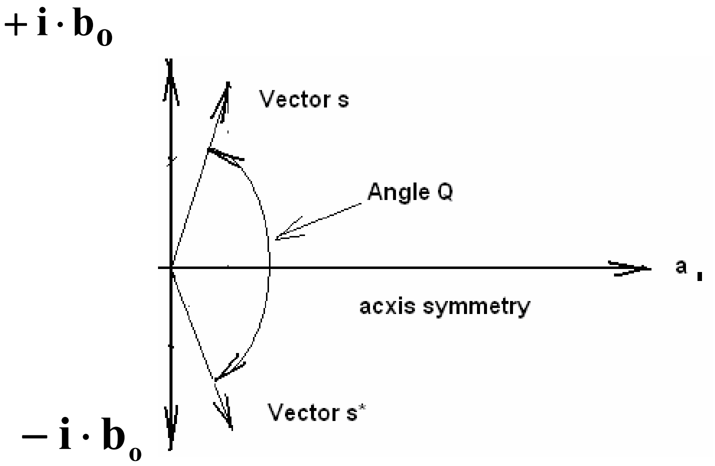
According this statement, we create endless series ζ functions for Riemann's Hypothesis .
The axis of abscissa a_o is geometrical axis symmetry for two a system coordinates, see Pic.1,Pic.2.

The angle Q is general argument for general ζ functions:

$$\zeta(S) = 2^S \pi^{S-1} \sin\frac{\pi S}{2}\, \Gamma\,(1 - S)\, \zeta(1 - S) = 0 \tag{338}$$

and

$$\zeta(S) = 2^S \pi^{S-1} \sin\frac{\pi S}{2}\, \Gamma\,(1 - S)\, \zeta(1 - S) = 1 \tag{339}$$



Pic. 10

Variant data № 2

If angle $Q = 0$, see Pic.1 , Pic.2 and Pic. 11, then:

$$\left.\begin{aligned} &+ib_o = 0 \\ &-ib_o = 0 \\ &\operatorname{Re}(s) = a_o \\ &\operatorname{Re}(s^*) = a_o \end{aligned}\right\} \tag{340}$$

According we have endless series numbers:

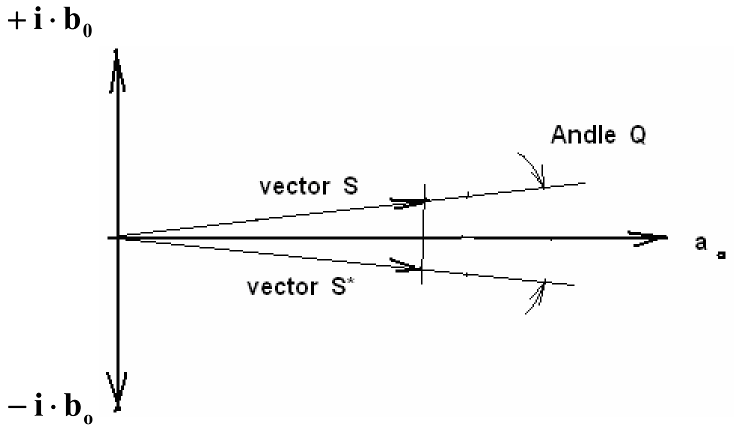
$$\begin{aligned} S &= s \cdot s^* = (a_0 + i \cdot b_0) \cdot (a_0 - i \cdot b_0) = \\ &= {a_0}^2 \end{aligned} \tag{341}$$

as endless series primitive numbers of Pythagorean
over field N natural numbers:

$$a_o = \sqrt{S} = (v^2 - u^2) \tag{342}$$

In the end we have endless vector products, as endless series zero:

$$S = [\, s, s^*] = |\, s \,| \cdot |\, s^* | \cdot \sin\, 0 = 0 \tag{343}$$



Pic. 11

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