

Is it time to unify physics and mathematics?

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Abstract

Physics and mathematics seem like two separate fields, but a deeper look can show that, in fact, they're really just one field and the same.

This is the subject of the present article.

In previous articles titled How to Generate New Mathematics Parts I, II, III, IV and What Do You Know About Quantum Mechanics Parts I, II, III, IV and What Do You Know About Electromagnetic Theory Parts I, II, III, the author showed that physics and mathematics are two sides of the same coin [2-5, 6-9, 10-12].

The current article is a continuation of the previous articles, as it applies the same traditional approach that has proven successful in integrating physics with mathematics, which is the following universal law in physics:

Energy density curvature $U(x,y,z,t)$ x Space time curvature $C(x,y,z,t) = I_{n,n} \dots (1^*)$

Note that equation 1* is the most important equation in physics and applied mathematics in the sense that any rule or theorem that does not agree with it must be incomplete or even wrong and should be refuted.

At the limit we would say that equation 1* is the only equation describing nature.

In fact equation 1 is introduced innovation by the author in 2020 [13,2-12] to describe physics and mathematics in closed control volume bounded with closed surface area which is subject to Dirichlet boundary conditions.*

The authors describe equation 1 as the golden equation because it solves all physical and mathematical situations. We can describe the current article as verifying the above statement, leading to the conclusion that equation 1* deserves its name.*

In this article, we follow a similar simple and clear technique, where we use Equation 1* to generate the known laws and theories in mathematics, classical physics, and quantum mechanics, as well as in electromagnetic theory, and then we agree that this is a solid answer to the question posed in the title of this article:

It is time to unify physics and mathematics.

I. A comprehensive introduction including theory and numerical results

Physics and mathematics are two sides of the same coin (Nature) and should be unified in the same 4D x-t space-time.

The Lorentz transformation shows us that the invariance of C requires space and time to be mixed together in a curved Space-time.

The fact described in the statement above motivated the authors to introduce the golden equation 1* into a new unified 4D xt space and claims that physics and mathematics can be unified in its space-time geometry into a single theory or, more precisely, into a single well-defined equation.

Energy Density curvature $U(x,y,z,t) * D^*$ Space-time Curvature $C(x,y,z,t) = I_{n,n} \dots (1^*)$

Where $I_{n,n}$ is the $n \times n$ unit matrix and n itself is the number of equidistant free nodes in the proposed closed control volume contained inside closed surface area subject to Dirichlet boundary conditions.

In reference 1 we find an elegant and thoughtful description of the new proposed theorem:

[“Ismail Abbas [1] proposes a reformulation of quantum mechanics and physics using Cairo techniques, bounded

statistical systems, and novel mathematical frameworks to uncover hidden laws in classical and quantum physics. Overview of Abbas's Approach:

Ismail Abbas, a PhD lecturer at Cairo University, has developed a series of theoretical frameworks aimed at addressing perceived limitations in classical and quantum physics. His work emphasizes that traditional mathematics has been used as a tool in physics but should not be assumed to generate new physical laws; instead, he argues that physics can reveal new mathematics through statistical and unitary approaches.

Key Concepts in Abbas's New Physics
1. Bounded Statistical Systems: Abbas introduces the concept of a bounded statistical system, defined as a closed control volume with Dirichlet boundary conditions. This framework is applied to

help resolve paradoxes such as Schrödinger's cat by potentially leading to a unified framework.
5. Discovery of Hidden Laws: Abbas claims that thousands of intrinsic laws and rules in physics, mathematics, and biochemistry remain undiscovered. His methods aim to systematically uncover these hidden patterns using statistical and unitary approaches. Implications Abbas's contributions are primarily theoretical and focus on providing a new mathematical and physical lens to

understand quantum phenomena, energy distributions, and the interplay between classical and relativistic physics. His work challenges conventional assumptions and proposes alternative formulations that could refine or extend current models in physics. In summary, Ismail Abbas's "new physics" revolves around bounded statistical systems, Cairo techniques, and reformulated quantum mechanics, aiming to reveal hidden laws and improve the accounting for information loss in open systems

Cairo Techniques: This is a 4D unitary numerical statistical method that Abbas uses to reformulate quantum mechanics. It involves transition chains and B-Transition Matrices to correct incomplete or misleading aspects of the Schrödinger equation, allowing for a more precise description of quantum energy distributions .3.

Reformulation of the Schrödinger Equation: Abbas proposes squaring the Schrödinger PDE to represent the quantum energy density as a real quantity, $\Psi^2 = \Psi \cdot \Psi^*$, which provides a clearer statistical interpretation of quantum states and energy distributions.4. **Integration with General Relativity:** His work also explores merging quantum mechanics with general relativity within bounded volumes, suggesting that electromagnetic and gravitational fields can be reformulated to align with quantum principles,]

In the following Section II titled Theory and Numerical Applications, we present and answer, using Equation 1*, seven important and urgent questions:

1-Is it true that science today is in the hands of science deniers?

2-Energy density diffusion in vacuum and Big Bang.

3- Derivation of new symmetric set of Maxwell equations in electro magnetism.

4-The Poynting vector $P=E \times H$ in dc circuits.

5-Why $E/H = 376$ Ohms in vacuum?

6- Theoretical and experimental evidence that magnetic monopole exist.

7-Narrow and true artificial intelligence AI.

In all the above seven questions belonging to different topics in physics and mathematics, we explain precisely how to construct the answer and corner stone of Nature which is transition matrix B , and furthermore how to uncover some new inherent physics and mathematics rules and theorems.

Note that the energy density curvature matrix $U(x,y,z,t)$ in equation 1* is equal to the transfer matrix $D(N)$, which is in turn expressed in terms of the statistical transition matrix $B(x,y,z,t)$ as [2-20],

$$D(N)=B +B^2+B^3 +.. +B^N \dots (2)$$

Equation 2 shows that the statistical transition matrix B is the cornerstone or the foundation of the new physics and mathematics.

Note also that today we know only two kinds of transition matrices, namely the well-known Markov statistical transition matrix M and the proposed B-transition statistical matrix where the superiority of the latter is evident.

Note also that the W. Heisenberg, Max Born and Pasqual Jordan in 1925 quantum statistical transfer matrix (HMJ theory) is neither transition nor statistical matrix.

We can shed more light and clarity on the nature of the transition matrix B by introducing the so-called transition matrix E, which is expressed as follows,

$$E(N) = B^0 + B + B^2 + B^3 + \dots + B^N \dots \dots (3)$$

Where N is the number of iterations or time steps dt.

It is obvious that $B^0 = I$ and $D(N) = E(N) - I$ for all values of integer number N.

Now we can state that the sum of infinite matrix series $E(N)$, $D(N)$ should converge to,

$$E(N) = 1/(I - B) \dots (4)$$

Equation 4 yields,

$$D(N) = 1/(I - B) - I \dots (5)$$

for sufficiently large values of N .

We recall that the most important equation in physics and mathematics 1* is not just a proposition, since its isotopes (Equations 2-5) have a rigorous definition and derivation, and both have also been successfully applied in all fields of physics and mathematics since 2020 [13,2-12].

The authors predict that the new physics based on and defining the curvature of space-time, Equation 1*, should exactly describe all of nature (mathematics, classical and quantum physics, as well as probability and statistics) and should therefore meet the following conditions and or the universal laws of physics:

1-Pythagorean theorem.

2-Energy conservation.

3-symmetry and reciprocity.

4-Lorentz transformation.

The four condition above implies that time should be discrete not continuum [14,15].

Moreover, the above four conditions i-iv implies the existence of a transition matrix B controlling the spatial-temporal evolution of the energy density U in the form:

$$U(x,y,z,t+dt) = B \cdot U(x,y,z,t) + B \cdot (b+S) \dots (6)$$

b and **S** are the vector of boundary conditions and the vector of the source term arranged in the right order.

Note that the statistical transition matrix must meet the above conditions i-iv (Pythagorean, energy conservation, symmetry and reciprocity, Lorentz transformation) and at the same time transmit them to curved space-time.

The physical meaning of equation 6 is that the space-time interval $dx dy dz dt$ is conserved under motion.

Equation 6 implies that for N successive time steps, we end up with,

$$U(x,y,z,Ndt) = D(N) U(x,y,z,t=0) + B^N \cdot (b+S) \dots (7)$$

Notice that B^N tends to zero as N goes to infinity since the norm of B is less than one.

Note also that equation 7 is equivalent to equation 1* which describes and applies to the whole of physics and mathematics.

PROPERTIES OF B-MATRIX

The statistical transition B-matrix in 1D,2D,3D itself is uniquely and well defined inside the closed control volume with Dirichlet boundary conditions (may be called Abbas control volume for distinction) through the following 4 statistical conditions [2-5,6-9,14,15,18,19].

The entries $B_{i,j}$ comply with or are subject to the following 4 statistical conditions for 2 D situations [1-14]:

i- $B_{i,j} = 1/4$ for i adjacent to j .. and $B_{i,j} = 0$ otherwise. This means that the prior probability is equal.

ii- $B_{i,i} = RO$, i.e. the main diagonal is made up of constant inputs RO .

For example, in mathematics and electromagnetism $RO=0$.

In the heat diffusion equation, RO can take any value in the closed interval $[0,1]$ while for Laplace and Poisson PDE, $RO = 0$.

That is to say that B is a null principal diagonal matrix when corresponds to the assumption of a null residue after each time step dt for all over the free nodes.

iii- $B_{i,j} = B_{j,i}$, for all i, j .

The matrix B is double symmetrical to conform to the physical principle of detailed balance and reciprocity.

iv- The sum of $B_{i,j} = 1$ for all the rows far from the borders and the sum $B_{i,j} < 1$ for all the rows connected to the borders meaning that the probability of the whole space = 1.

Obviously and again, the statistical matrix B is very different from the Laplace mathematical matrix A and from the Markov transition matrix M.

The physical nature of B is clear and briefly explained above through conditions I to iv which support hypothesis 3.

The only difficulty or complexity related to determining the B matrix input elements in classical physics and the Q matrix in quantum physics emerge from the process of pre-selecting the main diagonal elements (B_{ii} or RO), since this arbitrary choice is function of the nature of the problem under consideration and its physical characteristics.

However, the main diagonal elements of the transition matrix B can also be well defined depending on the nature of the container's environment, as follows:

For example:

i- $B_{ii} = 0$ for mathematical and electromagnetic problems.

ii- $B_{ii} = 0.2$ and 0.22 for the partial differential equation (PDE) governing heat diffusion in low-carbon Russian alloy steel and high-quality Egyptian aluminum, respectively.

And so on.

Note that, Improved knowledge and understanding of how to construct correct and efficient software algorithms using current programming languages, such as Fortran and C++ are well explained in references [16-20,21,22,25,26,27,30,31,32,32*].

On the other hand, mastery of matrix algebra operations, such as calculating eigenvalues and eigenvectors, as well as matrix multiplication, addition, inversion, and others are well explained in references [16-20,22,28,29,30].

To avoid getting bogged down in the introduction, let's move directly to the second section,

II-Theory and Numerical Applications

In this section of Theory and Numerical Applications we present and explain the intended topics in the form of Q & A.

1-Is it true that science today is in the hands of science deniers?

2-Energy density diffusion in vacuum and Big Bang.

3- Derivation of new symmetric set of Maxwell equations in electro magnetism.

4-The Poynting vector $P=E \times H$ in dc circuits.

5-Why $E/H = 376$ Ohms in vacuum?

6- Theoretical and experimental evidence that magnetic monopole exist.

7- What is real narrow artificial intelligence compared to general AI, which is called storage intelligence?

Q1-

Is it true that science today is in the hands of science deniers?

A1-

Yes.

It is true that science today is in the hands of science deniers whom we call brain washed and the source of all evil.

One of the most prominent examples is the energy diffusion in vacuum that caused Big Bang resulting in creation of our universe millions of years ago and still creating other universes almost daily.

They still deny the energy diffusion in vacuum and even the Big Bang itself.

We have diffused this Q/A just to show that science today is in the hands of science deniers and more catastrophically is that these brainwashed scientists continue transmitting these fallacies to our younger

generation of undergraduate and post graduate students in physics and mathematics.

Their answer about energy diffusion in vacuum states that:

1-the diffusion current

$$J_d = -D \nabla n$$

$$2- D = \frac{1}{3} \cdot v \lambda$$

$$3- \lambda = \frac{1}{\sqrt{2\pi} d^2 \cdot n}$$

[In normal conventions]

Equations 1, 2, and 3 show that the scalar diffusivity D is proportional to $1/\lambda$ (with scalar λ being the mean free path) and so, strictly speaking, diffusive transport by diffusion doesn't happen in a pure vacuum ($\lambda = \text{infinity}$) since the diffusion mechanism is absent.

Personally, we have not seen such amount of ignorance and stupidity before, have you?

Q2-

What about Energy density diffusion in vacuum and Big Bang?

A2-

In fact, the vacuum is not a void in the true sense; rather, it is in reality a substance teeming with energy densities—whether potential or kinetic.

Equation 1* which unifies physics and mathematics for energy density diffusion in vacuum is written as [2-12,24,25],

$$\nabla^2_{xx} \nabla^2_{xy} \nabla^2_{xz} \nabla^2_{xt}]U(x,y,z,t)$$

$$\nabla^2_{yx} \nabla^2_{yy} \nabla^2_{yz} \nabla^2_{yt}]U(x,y,z,t)$$

$$\nabla^2_{zx} \nabla^2_{zy} \nabla^2_{zz} \nabla^2_{zt}]U(x,y,z,t)$$

$$\nabla^2_{tx} \nabla^2_{ty} \nabla^2_{tz} \nabla^2_{tt}]U(x,y,z,t)$$

$$* D *$$

$$\nabla^2_{xx} \nabla^2_{xy} \nabla^2_{xz} \nabla^2_{xt}$$

$$\nabla^2_{yx} \nabla^2_{yy} \nabla^2_{yz} \nabla^2_{yt}$$

$$\nabla^2_{zx} \nabla^2_{zy} \nabla^2_{zz} \nabla^2_{zt}$$

$$\nabla^2_{tx} \nabla^2_{ty} \nabla^2_{tz} \nabla^2_{tt}$$

$$=I$$

In the case of One dimensional diffusion x:

$$\nabla^2_{xx} \quad 0 \quad 0 \quad \nabla^2_{xt}]U(x,y,z,t)$$

$$0 \quad 0 \quad 0 \quad 0]U(x,y,z,t)$$

$$0 \quad 0 \quad 0 \quad 0]U(x,y,z,t)$$

$$\nabla^2_{tx} \quad 0 \quad 0 \quad \nabla^2_{tt}]U(x,y,z,t)$$

The solution for energy density U (absolute temperature T) is symmetrical, linear, and triangular with its peak at

the central point or the center of mass (CM) as shown in Fig. 1 below.

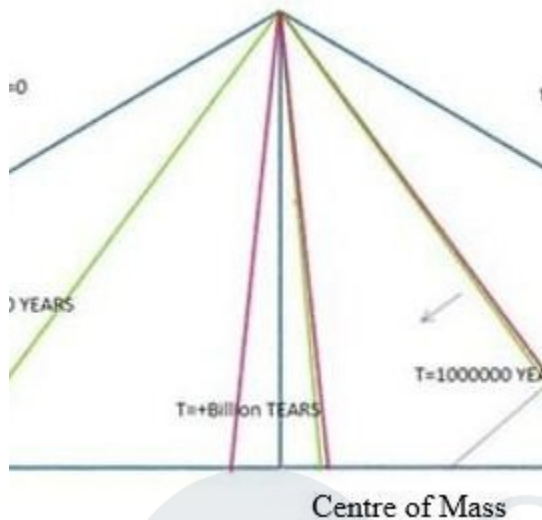


Fig.1. One dimensional energy density distribution (or absolute temperature T) millions of years ago.

Q3-

Derivation of new symmetric set of Maxwell equations in electro magnetism?

A3-

The Maxwell classical four simultaneous PDEs describing the electromagnetic field E and H in differential form [1,2,3,4,5]:

1- $\nabla \cdot \mathbf{E} = \rho / \epsilon$ Gauss Law

2- $\nabla \cdot \mathbf{H} = 0$ There is no magnetic monopole.

3- $\nabla \times \mathbf{E} = -\mu \frac{d\mathbf{H}}{dt}$ partial Faraday Law

4- $\nabla \times \mathbf{H} = \mathbf{J}_c + \epsilon \frac{d\mathbf{E}}{dt}$ partial Modified Amperes law

We expect that the equations mentioned above, set 1, when reformulated within the framework of the new physics or in equation 1* that we will call set 2, could work perfectly, and might even generate additional hidden internal theories and laws. In other words, we want to see what happens when we reformulate the four classical Maxwell equations above in the form of new physics, namely [2-6]:

1- $\nabla \cdot \mathbf{E} = \rho_e / \epsilon$ Gauss's law for electricity

2- $\nabla \cdot \mathbf{H} = \rho_m / \mu$ There exist magnetic monopoles m which can be positive or negative.

3- $\mathbf{J}_m = \nabla \times \mathbf{E} = -\mu \partial \mathbf{H} / \partial t$ Faraday's law in magnetism, there exists a magnetic monopole conduction current $\mathbf{J}_m$

4- $\nabla \times \mathbf{H} = -\mathbf{J}_c + \epsilon \partial \mathbf{E} / \partial t$

The modern correct Maxwell's equations described by the set (2) above can easily show that: i- The Poynting vector $\mathbf{P} = \mathbf{E} \times \mathbf{H}$ is valid for DC circuits. ii- The E/H ratio in vacuum is 376 ohms, ...etc. It is REALLY true that today's science is in the hands of those who deny science.

Q4-

What are Einstein special and general relativity?

A4-

Einstein special relativity is nothing but Lorentz transformation in one dimension x-t and Einstein general relativity is nothing more than Lorentz transformation in three dimension x,y,z,t which means that Einstein special relativity can be derived from Einstein general relativity.

However, Einstein failed in deriving special relativity from his general relativity and the two theories remains separate to this day.

On the other hand, deriving special relativity from general relativity is possible and simple through the application of the golden rule or equation 1* as follows:

$$\nabla^2_{xx} \nabla^2_{xy} \nabla^2_{xz} \nabla^2_{xt}]U(x,y,z,t)$$

$$\nabla^2_{yx} \nabla^2_{yy} \nabla^2_{yz} \nabla^2_{yt}]U(x,y,z,t)$$

$$\nabla^2_{zx} \nabla^2_{zy} \nabla^2_{zz} \nabla^2_{zt}]U(x,y,z,t)$$

$$\nabla^2_{tx} \nabla^2_{ty} \nabla^2_{tz} \nabla^2_{tt}]U(x,y,z,t)$$

WE call it M1

* D *

$$\nabla^2_{xx} 0 0 \nabla^2_{xt}$$

$$\nabla^2_{yx} \nabla^2_{yy} \nabla^2_{yz} \nabla^2_{yt}$$

$$\nabla^2_{zx} \nabla^2_{zy} \nabla^2_{zz} \nabla^2_{zt}$$

$$\nabla^2_{tx} \nabla^2_{ty} \nabla^2_{tz} \nabla^2_{tt}$$

We call it M2

Note that $M1 * M2 = I \dots (1^*)$

The above matrix equation is GR

On the other hand the special relativity is expressed in matrix notation as,

$$\begin{bmatrix} \nabla^2_{xx} & 0 & 0 & \nabla^2_{xt} \end{bmatrix} U(x,t)$$

$$\begin{bmatrix} 0 & 0 & 0 & 0 \end{bmatrix} U(x,t)$$

$$\begin{bmatrix} 0 & 0 & 0 & 0 \end{bmatrix} U(x,t)$$

$$\begin{bmatrix} \nabla^2_{tx} & 0 & 0 & \nabla^2_{tt} \end{bmatrix} U(x,t)$$

We call it $M3$

$* D *$

$$\begin{bmatrix} \nabla^2_{xx} & \nabla^2_{xy} & \nabla^2_{xz} & \nabla^2_{xt} \end{bmatrix}$$

$$\begin{bmatrix} \nabla^2_{yx} & \nabla^2_{yy} & \nabla^2_{yz} & \nabla^2_{yt} \end{bmatrix}$$

$$\begin{bmatrix} \nabla^2_{zx} & \nabla^2_{zy} & \nabla^2_{zz} & \nabla^2_{zt} \end{bmatrix}$$

$$\begin{bmatrix} \nabla^2_{tx} & \nabla^2_{ty} & \nabla^2_{tz} & \nabla^2_{tt} \end{bmatrix}$$

We call it $M4$

Note that $M3 * M4 = I \dots (1^{**})$

The above matrix multiplication $M3 . M4$ in 1^{**} is a subset of previous matrix multiplication $M1.M2$ in 1^* .

$M1 M2$ is GR.

And,

$M3 M4$ is SR.

Now, it is clear that the theory of SR is only a subset of theory of GR and that both SR and GR are only one theory not two.

Q5-

Why $E/H = 376$ Ohms in vacuum?

A5-

In reference 1 we find,

From the above definition, and the plane wave solution to Maxwell's equations,

NOTE THAT THE ABOVE DEFINITION IS MISSING!?

,

$$Z(0) = \sqrt{\mu_0 / \epsilon_0}$$

$\mu_0 \approx 12.566 \times 10^{-7}$ H/m known as the permeability of free space,

$$\epsilon_0 \approx 8.854 \times 10^{-12}$$
 F/m

known as the permittivity of free space,

Personally, I didn't understand a bit, DID YOU?

On the other hand a similar proof to that in Q4/A4 can show easily that $(E/H)^2 = (\mu_0 / \epsilon_0) = Z(0)^2$

Q6-

What are the theoretical and experimental proofs that the magnetic monopole exists?

A6-

? The existence of magnetic monopole is confirmed theoretically through authors of the present article among others [10,11,12].

The magnetic monopole can,t be detected experimentally because the life span of magnetic monopole is much shorter than the time required for measurement.

However, in the case when the life span of magnetic monopole or, any other quantum particle, is much shorter than the time required for measurement you can measure experimentally the evidence of its decay or its remains as shown in Fig.1.

That is exactly what happened when the authors measured the growth and decay of magnetic bacteria in their own electric field E and arrived at the formula:

$n(\text{number of magnetic monopoles}) = T \times E \dots (\text{Fig 1})$

Where T is the absolute temperature of the accommodating medium.

Q7-

What is real narrow artificial intelligence compared to general AI, which is called storage intelligence?

A7-

If you don't understand artificial intelligence, ask yourself if I am right because others don't understand it either.

There is no generally applicable definition of artificial intelligence [26]. The field is so vast that its actors will always have to develop a more precise definition of their own objectives in their context. Artificial intelligence is broadly defined as the simulation of human intelligence by machines programmed to learn, reason, and solve problems. Therefore, AI encompasses several subfields, including machine learning (ML), deep learning (DL), robots, natural language processing (NLP), and computer vision, etc., each with distinct applications and limitations.

And yet, AI can be classified into two main categories:

i- Narrowly defined AI (concrete definition of AI) Which is simply defined as an automated algorithm operating on the basis of statistical transition matrices, which allows it to increase the amount of existing information.

ii- General AI (broad definition of AI): such as machine learning (ML), deep AI (DAI), image and voice recognition, etc. These broad AI systems that operate according to predefined parameters and lots of input data cannot be generalized beyond their designated functions. We believe that the term AI should be reserved for software capable of increasing the amount

of information that is the function of only humans (and much less other creatures) and unitary 4D x-t statistical transition matrices. Note that the link between artificial intelligence and 4D x-t unit space is revealed for the very first time. Some hypothetical AIs with human-like cognitive abilities including reasoning, writing and reading rules, pronunciation, specific tasks such as facial recognition, speech processing, etc. are usually called AI systems, which is not true. These systems operate in classic 3D+t space and obviously cannot increase the amount of existing information and therefore cannot be qualified as artificial intelligence. We can conveniently call these systems storage intelligence systems (SI systems) rather than artificial intelligence systems. On the other hand, concrete and narrow AI in 4D x-t unit space remains a well-defined theoretical and practical construct with many existing examples in physics and mathematics as well as in real daily life.

III-CONCLUSION

The present study shows that the same transition matrix or equation 1* solves all kinds of mathematical and physical situations.

The authors describe equation 1* as the golden equation because it solves all physical and mathematical problems. We can describe the current article as

verification of the above statement through answering with high precision seven relevant questions:

1-Is it true that science today is in the hands of science deniers?

2-Energy density diffusion in vacuum and Big Bang.

3- Derivation of new symmetric set of Maxwell equations in electro magnetism.

4-The Poynting vector $P = E \times H$ in dc circuits.

5-Why $E/H = 376$ Ohms in vacuum?

6- Theoretical and experimental evidence that magnetic monopole exist.

7-Narrow and true artificial intelligence AI.

leading to the conclusion that equation 1* deserves its name as the golden equation and that it is time to unify physics and mathematics.

Finally, the authors recall that the proposed article mentioned in the title is just a small step on a long road and that sooner or later it will prevail over today's classical science.

Note: In the previous calculations, the author used his own double precision algorithm as explained in ref. 28,29.

No ready-made algorithms such as Python or MATLAB are required.

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