



An Electrical Engineering Framework for the Universe: A Proposed AT Math Model

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ABSTRACT

This paper proposes an electrical-engineering framework for investigating the author's AT Math as a mathematical model of the universe. The framework combines the Golden Mean Parabola, logarithmic transformations, trigonometric phase relationships, Fourier analysis, exponential functions, energy relationships, and characteristic periods.

The central AT Math relationship is

$$t^2 - t - 1 = E,$$

where E is treated as a residual or energy-like quantity. When $E = 0$, the positive solution is the Golden Ratio, 1.618033988..., while the negative solution is $-0.618033988...$

The paper investigates the use of these quantities in electrical-engineering mathematics, particularly wave propagation, phase, frequency, Fourier transformation, exponential decay, and system dynamics. Numerical relationships involving $\sin(60^\circ)$, $\sqrt{3}$, the reciprocal value $8/3 \approx 2.667$, and characteristic periods are examined.

The proposed framework is exploratory. Established equations of electrical engineering and physics are distinguished from numerical relationships proposed by AT Math. The ultimate test of the framework would be whether it produces dimensionally consistent and experimentally testable predictions that differ from existing theories.

Keywords: AT Math, electrical engineering, cosmology, Fourier transform, Golden Ratio, Golden Mean Parabola, phase, frequency, energy, information, mathematical physics

1. INTRODUCTION

Electrical engineering provides a mathematical language for describing physical systems through voltage, current, energy, frequency, phase, waves, impedance, information, and time.

The universe can likewise be regarded as a physical system containing matter, energy, fields, radiation, waves, information, and interactions.

This paper investigates whether mathematical structures used in electrical engineering can provide a framework for exploring the author's AT Math model of the universe.

The proposed framework is based on several mathematical relationships, particularly

$$t^2 - t - 1 = E$$

and

$$M = \ln(t).$$



The first equation is called the **Golden Mean Parabola (GMP)** in the AT Math framework.

When $E = 0$:

$$t^2 - t - 1 = 0$$

and therefore

$$t = (1 + \sqrt{5})/2 = 1.618033988...$$

The second root is

$$t = -0.618033988....$$

The reciprocal relationship is

$$1/1.618033988... = 0.618033988....$$

These values provide the principal mathematical constants investigated in this paper.

2. ELECTRICAL ENGINEERING AS A MODEL OF PHYSICAL SYSTEMS

Electrical engineering demonstrates how physical systems can be represented using mathematical equations.

Ohm's law is

$$V = IR.$$

Electrical power is

$$P = VI.$$

A capacitor stores energy according to

$$E = 1/2 CV^2$$

and an inductor stores energy according to

$$E = 1/2 LI^2.$$

Electromagnetic waves are described by Maxwell's equations and their resulting wave equations.

A simplified electromagnetic wave equation is

$$\nabla^2 E - (1/c^2)(\partial^2 E / \partial t^2) = 0.$$

A sinusoidal wave can be represented by

$$y = A \sin(kx - \omega t + \phi).$$

Thus electrical engineering naturally connects:

energy → fields → waves → frequency → phase → information.

AT Math investigates whether analogous mathematical relationships can be extended to a cosmological model.



3. THE GOLDEN MEAN PARABOLA

The fundamental proposed AT Math equation is

$$t^2 - t - 1 = E.$$

Rearranging:

$$E = t^2 - t - 1.$$

When $E = 0$:

$$t^2 - t - 1 = 0.$$

The solutions are

$$t = 1.618033988...$$

and

$$t = -0.618033988....$$

The positive root is the Golden Ratio:

$$\phi = 1.618033988...$$

and its reciprocal is

$$1/\phi = 0.618033988....$$

The negative root therefore has the same magnitude as the reciprocal Golden Ratio.

This produces a mathematical system containing both

$$1.618$$

and

$$-0.618.$$

AT Math investigates whether these two values can function as complementary parameters in mathematical descriptions of physical systems.

4. TRIGONOMETRIC GEOMETRY

A second important relationship is

$$\sin(60^\circ) = \sqrt{3}/2.$$

Therefore,

$$\sin^2(60^\circ) = 3/4 = 0.75.$$

The complementary quantity is

$$1 - 0.75 = 0.25.$$



The four angles

$$0^\circ, 30^\circ, 60^\circ, 90^\circ$$

correspond to

$$0, \pi/6, \pi/3, \pi/2.$$

Their sum is

$$0 + \pi/6 + \pi/3 + \pi/2 = \pi.$$

Thus:

$$0^\circ + 30^\circ + 60^\circ + 90^\circ = 180^\circ.$$

This provides a simple phase system spanning half of a complete sinusoidal cycle.

5. THE 1.082 AND SEVEN-PERIOD RELATIONSHIP

The AT Math framework introduces

$$\sin(60^\circ) \times 1.25$$

which gives

$$0.8660254 \times 1.25 = 1.0825318....$$

Thus approximately:

$$1.082.$$

Using a seven-period transformation:

$$(1.082)^7 \approx 1.735.$$

The nearby fundamental value is

$$\sqrt{3} = 1.7320508....$$

Consequently,

$$(1.082)^7 \approx \sqrt{3}.$$

This is a numerical correspondence proposed by AT Math rather than an established physical law.

6. A DERIVED 2.667 RELATIONSHIP

Using the value

$$t = 0.75$$

and $M = 4$, the proposed expression

$$t^2 - t/M$$

becomes



$$0.75^2 - 0.75/4$$

$$= 0.5625 - 0.1875$$

$$= 0.375.$$

Therefore:

$$0.375 = 3/8.$$

Taking the reciprocal:

$$1/0.375 = 8/3$$

$$= 2.666666....$$

Thus the AT Math value

$$2.667$$

has the exact mathematical representation

$$8/3.$$

This relationship is independent of any physical interpretation and follows directly from the stated arithmetic.

7. FOURIER ANALYSIS

Fourier analysis provides a direct connection with electrical engineering.

A continuous Fourier transform may be written as

$$F(u) = \int_{-\infty}^{\infty} f(x) e^{(2\pi i u x)} dx.$$

The sign convention can alternatively use $-2\pi i u x$.

Within AT Math, the proposed function is

$$f(x) = x^2 - x - 1.$$

The Fourier transform therefore provides a frequency-domain representation of the Golden Mean Parabola.

This is conceptually important because electrical engineering routinely changes between:

time domain ↔ frequency domain.

Frequency-domain analysis is fundamental to communication, signal processing, electromagnetic theory, control systems, and circuit analysis.

8. FOURIER PHASE

Consider the phase condition

$$2\pi u'x = 180^\circ = \pi \text{ radians.}$$

Then



$$\sin(2\pi u'x) = \sin(\pi) = 0.$$

Consequently,

$$f(x)\sin(2\pi u'x) = 0.$$

The 180° point is therefore a zero crossing of the sinusoidal component.

This is a standard trigonometric result and provides a useful reference point for the AT Math Fourier construction.

9. FOURIER AND THE NEGATIVE GOLDEN ROOT

Consider the proposed values

$$u = 1/\pi$$

and

$$t = -0.618.$$

The Fourier phase exponent becomes

$$\begin{aligned} 2\pi ut \\ &= 2\pi(1/\pi)(-0.618) \\ &= -1.236. \end{aligned}$$

Therefore the complex Fourier factor is

$$e^{(-1.236i)}.$$

The Golden Mean Parabola evaluated at -1.236 gives:

$$\begin{aligned} f(t) &= t^2 - t - 1 \\ &= (-1.236)^2 - (-1.236) - 1 \\ &\approx 1.7637. \end{aligned}$$

Thus:

$$f(t) \approx 1.764.$$

This demonstrates a proposed connection between the Golden Mean quantities and a Fourier phase parameter.

10. THE 1.764 AND $\sqrt{3}$ RELATIONSHIP

Using the calculated value:

$$f(t) \approx 1.7637$$

and the additional proposed quantity:

$$3.77,$$



we obtain approximately:

$$1.7637^2 + 3.77^2 \approx 17.32.$$

Since

$$10\sqrt{3} = 17.320508...,$$

the numerical relationship can be expressed approximately as

$$1.7637^2 + 3.77^2 \approx 10\sqrt{3}.$$

This is a numerical correspondence, not an established identity.

The distinction is important because numerical proximity alone does not establish a physical relationship.

11. EXPONENTIAL REPRESENTATION

A related AT Math expression uses

$$e^{(-2t)}.$$

For

$$t = 0.618,$$

we obtain

$$e^{(-2 \times 0.618)}$$

$$= e^{(-1.236)}$$

$$\approx 0.2907.$$

Therefore:

$$1/e^{(1.236)} \approx 0.2907$$

and

$$1/0.2907 \approx 3.44.$$

The exponent 1.236 is approximately twice the Golden Ratio reciprocal:

$$2(0.618) \approx 1.236.$$

The complex Fourier expression

$$e^{(-1.236i)}$$

should be distinguished from the real exponential

$$e^{(-1.236)}.$$

The former represents phase rotation; the latter represents exponential attenuation.



12. LOGARITHMIC SCALING

AT Math proposes:

$$M = \ln(t).$$

Therefore:

$$t = e^M.$$

For

$$M = 1.5,$$

we obtain:

$$t = e^{1.5}$$

$$= 4.481689...$$

$$\approx 4.482.$$

The proposed linear relationship

$$B = 88.35H + 1.77$$

with

$$H = 4.482$$

gives

$$B = 88.35(4.482) + 1.77$$

$$\approx 398.05.$$

These calculations demonstrate the interaction of logarithmic and linear transformations within the proposed mathematical framework.

13. CHARACTERISTIC PERIOD

The AT Math framework proposes a characteristic quantity of approximately

$$T \approx 0.2506.$$

This is close to:

$$1/4 = 0.25.$$

If T represents a period, the corresponding frequency is

$$f = 1/T.$$

Thus:

$$f \approx 1/0.2506 \approx 3.99.$$



In electrical engineering, period and frequency are reciprocal:

$$fT = 1.$$

Any physical interpretation of T within cosmology would require a definition of its units.

14. THE 0.344 AND 2.509 RELATIONSHIP

Another proposed numerical sequence is:

$$0.344 \times 7.29 = 2.50776.$$

Thus approximately:

$$0.344 \times 7.29 \approx 2.508.$$

If the intended characteristic period is approximately 2.509, then its reciprocal is:

$$1/2.509 \approx 0.3986.$$

This illustrates the importance of maintaining the distinction between a quantity and its reciprocal when assigning the symbol T to a period.

The relationship

$$T = 1/f$$

requires consistent numerical and dimensional definitions.

15. ENERGY AND MASS

The established relativistic relationship is:

$$E = Mc^2.$$

The AT Math framework investigates whether mass and energy can be incorporated into a broader system involving t, M, and E.

An additional proposed relationship is:

$$B = M.$$

The physical meaning of B, M, and H must be specified before these variables can be interpreted as physical quantities.

The electrical-engineering analogy is that different physical quantities can be related through a system of equations, provided their units and definitions are consistent.

16. THE FIXED-POINT RELATION $Y = Y'$

AT Math also proposes:

$$y = y'.$$

The exponential function provides the simplest standard example:

$$y = e^x$$

and

$$y' = e^x.$$

Therefore:

$$y = y'.$$

Electrical engineering uses exponential functions extensively in transient circuits, feedback systems, charging and discharging, and dynamical systems.

The proposed AT Math interpretation is that a physical system may be represented by a mathematical state whose rate of change reproduces the state itself.

17. ENERGY, WAVES, AND INFORMATION

The proposed AT Math model can be represented conceptually as:

Energy → Field → Wave → Frequency → Phase → Interaction → Matter → Information.

Electrical engineering provides mathematical tools at almost every stage of this sequence.

Fourier analysis represents frequency.

Complex numbers represent phase.

Differential equations represent dynamical systems.

Circuit equations represent energy transfer.

Information theory represents communication and system state.

AT Math proposes that the Golden Mean Parabola may provide an additional mathematical structure linking these descriptions.

18. A PROPOSED COSMOLOGICAL MODEL

The proposed mathematical architecture can be summarized as:

$$\begin{array}{c}
 t^2 - t - 1 = E \\
 \downarrow \\
 M = \ln(t) \\
 \downarrow \\
 \sin(\theta) \\
 \downarrow \\
 F(u) = \int f(x)e^{(2\pi iux)}dx \\
 \downarrow \\
 \text{frequency} \\
 \downarrow \\
 \text{period} \\
 \downarrow \\
 \text{energy} \\
 \downarrow \\
 \text{information.}
 \end{array}$$



The purpose is not to assert that these equations are already a unified physical theory, but to investigate whether they can form a mathematically consistent system.

19. DIMENSIONAL CONSISTENCY

A critical requirement for further development is dimensional consistency.

The expression

$$t^2 - t - 1$$

is dimensionless if t is dimensionless.

Therefore, if

$$t^2 - t - 1 = E$$

is interpreted as physical energy, E must either be a normalized energy or a dimensional conversion factor must be introduced.

Similarly, in the Fourier transform:

$$ux$$

must be dimensionless.

Consequently, u must have reciprocal units to x .

These requirements are essential if AT Math is to progress from numerical relationships to a physical engineering model.

20. TESTABILITY

A physical theory must ultimately produce testable predictions.

For AT Math, the following questions are particularly important:

1. What physical quantities do t , E , M , B , H , u , and T represent?
2. What are their units?
3. What normalization constants are required?
4. Can the Fourier relationships be derived rigorously?
5. Does the model reproduce established electromagnetic results?
6. Does it reproduce established relativistic and quantum results?
7. Does it predict a new measurable phenomenon?
8. Can the predictions be independently reproduced?

These questions provide a path from mathematical exploration toward an experimentally testable theory.



21. DISCUSSION

The AT Math relationships examined here contain several recurring numerical structures:

Golden Ratio

1.618033988...

Golden reciprocal

0.618033988...

60-degree geometry

$$\sin^2(60^\circ) = 3/4$$

Seven-period relationship

$$(1.082)^7 \approx \sqrt{3}$$

Golden Mean Parabola

$$t^2 - t - 1 = E$$

Logarithmic relationship

$$M = \ln(t)$$

Fourier transformation

$$F(u) = \int f(x) e^{(2\pi i u x)} dx$$

Characteristic period

$$T \approx 0.2506$$

Reciprocal relationship

$$1/(3/8) = 8/3 \approx 2.667$$

and the exponential relationship

$$e^{(-1.236)} \approx 0.2907.$$

These relationships form the mathematical basis for the proposed AT Math investigation.

The strongest mathematical results are those that follow exactly from the stated equations. Approximate numerical coincidences should remain identified as such until a theoretical derivation explains why they occur.

22. CONCLUSION

This paper has developed a proposed electrical-engineering framework for investigating AT Math as a mathematical model of the universe.

The central equation is:

$$t^2 - t - 1 = E.$$



It generates the Golden Ratio when $E = 0$ and contains the reciprocal Golden Ratio through its negative root.

The framework additionally incorporates:

$$\sin^2(60^\circ) = 3/4$$

$$M = \ln(t)$$

$$y = y'$$

$$(1.082)^7 \approx \sqrt{3}$$

$$F(u) = \int_{-\infty}^{\infty} f(x)e^{(2\pi iux)}dx$$

and

$$e^{(-2 \times 0.618)} \approx 0.2907.$$

The proposed Fourier construction connects the Golden Mean Parabola with frequency-domain analysis, while the electrical-engineering framework provides established mathematical concepts of phase, frequency, energy, waves, and information.

The numerical relationship

$$0.375 = 3/8$$

and therefore

$$1/0.375 = 8/3 \approx 2.667$$

is an exact mathematical result within the stated construction.

Other relationships, such as

$$1.7637^2 + 3.77^2 \approx 10\sqrt{3}$$

are numerical correspondences requiring further investigation.

The proposed framework should therefore be regarded as a mathematical research program rather than an established physical theory. Its development depends on rigorous definitions, dimensional consistency, derivation from physical principles, numerical testing, and ultimately experimental verification.

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