JAMAME Journal of Advanced Mathematics and Mathematics Education
2024, VOL. 07, NO. 2, 9-16

Gaussian theorem on the algebraic representation of functions

Avelanda
gorthell@gmail.com

Abstract

Evaluation of the Gaussian theorem at the origin, and transforming it around the plane to verify the generality of its application as possible proof for its derivation and implication; along with the Gelfond's constant. And therefore; including its covariance as a fundamental factor regarding the validation of its existence, and that of the complex plane itself.

Introduction

By inquiry, we apply reason so to ascertain the unknown. However, at certain intervals, and given possible conditions, conjectures and theorems do not hold. Not because the argument is false; but because there's either insufficient detail in any of the proofs presented, or available in mathematical literature to validate them. Or rather, pertaining the subject. What follows is the foundation of Gauss's understanding of the application of complex numbers as possible coordinates on the plane. And through which, the Gelfond's constant is retained, as reciprocals are an algebraic representation of its covariance, so that not only, are complex values proven to be cyclic; but also fundamental given their generality on the Cartesian coordinate system. Based on the context with which it applies, by contrary terms in which it is probable by the statement of the conjecture; then it can be justifiable in various ways, and the theorem truly, holds. For proof is the only remedy for all our woes in mathematics, and whether it is by contradiction, exhaustion, or infinite descent. The only thing that matters is that the result is justifiable. Thus, it is shown that it cannot be unjustifiable by rigorous proof that such is true, and if so, then how can it be stated otherwise, such that it does not exist at all- given the laws of nature? If logical; then it is consistent with the laws of nature (as they hold). Then for all possible values of **m**, it holds as follows: $\boldsymbol{x^m + Ax^{m-1} + Bx^{m-2}} + \cdots$such that $\boldsymbol{x^m + Ax^{m-1} + Bx^{m-2} = 0}$

$$\boldsymbol{x^m = -Ax^{m-1} - Bx^{m-2}}$$

$$\boldsymbol{\frac{x^m}{x^m} = \frac{-x^m(Ax^{-1} + Bx^{-2})}{x^m}}$$

$$\boldsymbol{1 = -1(Ax^{-1} + Bx^{-2})}$$

$$\therefore \boldsymbol{-1(Ax^{-1} + Bx^{-2}) = 1}$$

Or say; that then $\boldsymbol{\frac{1}{Ax^{-1} + Bx^{-2}} = -1}$

$$\therefore \boldsymbol{A^{-1}x + B^{-1}x^2 = -1}$$

Suddenly, the values are possibly real; yet since the plane is also complex- thus, any object has its complex representation. And if $\boldsymbol{x^m + Ax^{m-1} + Bx^{m-2} = 0}$

$$\therefore \boldsymbol{x^m = -x^m(Ax^{-1} + Bx^{-2})}$$

Or

$$-Bx^{m-2} = x^m + Ax^{m-1}$$

$$-Bx^{m-2} = -x^m - Ax^{m-1}$$

$$\therefore Bx^{m-2} = -1(x^m + Ax^{m-1})$$

Or

$$-x^m - Ax^{m-1} = Bx^{m-2}$$

$$-Ax^{m-1} = x^m + Bx^{m-2}$$

$$Ax^{m-1} = -1(x^m + Bx^{m-2})$$

$$x^{m-1} = \frac{-1(x^m + Bx^{m-2})}{A}$$

$$\therefore x^{m-1} = \left(-1(x^m + Bx^{m-2})\right)A^{-1}$$

Such that, we can further argue that $\frac{Ax^{m-1}}{x^m + Bx^{m-2}} = -1$

$$\therefore Ax^{m-1}(x^{-m} + B^{-1}x^{-m+2}) = -1$$

Then the following holds: $Ax^{(m-1)-m} + AB^{-1}x^{(m-1)+(-m+2)} = -1$

$$Ax^{-1} + AB^{-1}x = -1$$

$$\frac{Ax^{-1} + AB^{-1}x}{-1} = \frac{-1}{-1}$$

$$\therefore -1(Ax^{-1} + AB^{-1}x) = 1$$

Such that it follows from there that $x^m = -x^m(Ax^{-1} + Bx^{-2})$

$$x = \sqrt[m]{-x^m(Ax^{-1} + Bx^{-2})}$$

$$x = \sqrt[m]{-x^m}\left(\sqrt[m]{Ax^{-1} + Bx^{-2}}\right)$$

$$x = -x^{\frac{m}{m}}\left(\sqrt[m]{Ax^{-1} + Bx^{-2}}\right)$$

$$\therefore x = -x\sqrt[m]{Ax^{-1} + Bx^{-2}}$$

While it also holds as follows: such that $\frac{x}{-x} = \sqrt[m]{Ax^{-1} + Bx^{-2}}$

$$(-1)^m = Ax^{-1} + Bx^{-2}$$

$$B = \frac{(-1)^m - Ax^{-1}}{x^{-2}}$$

$$B = ((-1)^m - Ax^{-1})x^2$$

$$B = (-1)^m(x^2) - Ax$$

$$\therefore B = x((-1)^m x - A)$$

Then for the fact that such is true; then $B + (-1)^m x^2 = Ax$

$$A = \frac{B + (-1)^m(x^2)}{x}$$

$$A = \left(B + (-1)^m(x^2)\right)x^{-1}$$

$$A = Bx^{-1} + (-1)^m x^{2-1}$$

$$\therefore A = Bx^{-1} + (-1)^m x$$

So that if $\frac{A - (-1)^m x}{x^{-1}} = B$

$$B = (A - (-1)^m x)x$$

$$\therefore B = Ax - (-1)^m x^2$$

Now, it is clear that the Gaussian theorem is retained. And proven to exist as a generality that holds covariant, as any truth cannot hold false. Then as a result;

$$x^m + Ax^{m-1} + Bx^{m-2} = 0$$

$$x^2 + (Bx^{-1} + (-1)^m x)(x^{m-1}) + (Ax - (-1)^m x^2)(x^{m-2}) = 0$$

$$x^2 + Bx^{m-2} + ((-1)^m x^m) + Ax^{m-1} - ((-1)^m x^m) = 0$$

$$x^2 + Bx^{m-2} + Ax^{m-1} = 0$$

$$x^2 + Bx^{m-2} + (-x^m - Bx^{m-2}) = 0$$

$$x^2 - x^m = 0$$

$$x^2 = x^m$$

$$\frac{x^2}{x^2} = \frac{x^m}{x^2}$$

$$1 = x^m(x^{-2})$$

$$\therefore x^{m-2} = 1$$

Or $\boldsymbol{x^{-m+2} = 1}$

Such that for all the above it then truly follows that: $\boldsymbol{x^{m-2} = x^{-m+2}}$

$$\boldsymbol{m-2 = -m+2}$$

$$\boldsymbol{2m = 4}$$

$$\boldsymbol{m = \frac{4}{2}}$$

$$\boldsymbol{\therefore m = 2}$$

Hence $\boldsymbol{x^m + Ax^{m-1} + Bx^{m-2} = 0}$

$$\boldsymbol{x^2 + Ax^{2-1} + Bx^{2-2} = 0}$$

$$\boldsymbol{\therefore x^2 + Ax + B = 0}$$

From then onwards- what follows holds: $\boldsymbol{x^m + Ax^{m-1} + Bx^{m-2} = 0}$

$$\boldsymbol{x^2 + Ax^{2-1} + Bx^{2-2} = 0}$$

$$\boldsymbol{x^2 + Ax^{-1} + B = 0}$$

$$\boldsymbol{x^2 = -Ax^{-1} - B}$$

$$\boldsymbol{\therefore x^2 = -1(Ax^{-1} + B)}$$

Such that if $\boldsymbol{x^2 = x^m}$

$$\boldsymbol{x^m = -1(Ax^{-1} + B)}$$

$$\boldsymbol{\frac{x^m}{Ax^{-1}+B} = \frac{-1(Ax^{-1}+B)}{Ax^{-1}+B}}$$

$$\boldsymbol{\therefore \frac{x^m}{Ax^{-1}+B} = -1}$$

And if $\boldsymbol{x^m + Ax^{m-1} + Bx^{m-2} = 0}$

$$\boldsymbol{x^m(1 + Ax^{-1} + Bx^{-2}) = 0}$$

$$\boldsymbol{x^m\left(1 + \frac{A}{x} + \frac{b}{x^2}\right) = 0}$$

$$\boldsymbol{x^m\left(1 + \frac{Ax^2+Bx}{x^3}\right) = 0}$$

$$\boldsymbol{x^m\left(1 + \frac{x(Ax+B)}{x(x^2)}\right) = 0}$$

$$x^m\left(1+\frac{Ax+B}{x^2}\right)=0$$

$$\frac{x^m\left(1+\frac{Ax+B}{x^2}\right)}{x^m}=\frac{0}{x^m}$$

$$1+\frac{Ax+B}{x^2}=0$$

$$\frac{Ax+B}{x^2}=-1$$

$$\therefore x^2+Ax+B=0$$

So that if $x^2=x^m$

$$\frac{x^2}{x^2}=\frac{x^m}{x^2}$$

$$1=\frac{x^m}{-1(Ax^{-1}+B)}$$

$$1=x^m((-Ax^{-1}-B)^{-1})$$

$$\frac{1}{(-Ax^{-1}-B)^{-1}}=\frac{x^m(-Ax^{-1}-B)^{-1}}{(-Ax^{-1}-B)^{-1}}$$

$$\therefore x^m=-Ax^{-1}-B$$

Or say then that if $1=\frac{x^m}{-1(Ax^{-1}+B)}$

$$x^m=\left(1\left(-1(Ax^{-1}+B)\right)\right)$$

$$\therefore x^m=-Ax^{-1}-B$$

Thus, it follows since it cannot be false that as a result, then: $x^m+Ax^{m-1}+Bx^{m-2}=0$

$$(-Ax^{-1}-B)+(-x^m-Bx^{m-2})+B(1)=0$$

$$(-Ax^{-1}-B)+\left(-(-Ax^{-1}-B)-\left(B(1)\right)\right)+B=0$$

$$-Ax^{-1}-B+Ax^{-1}+B-B+B=0$$

$$-Ax^{-1}+Ax^{-1}-2B+2B=0$$

$$0-2B+2B=0$$

$$\therefore 0=0$$

On which since $a+b\sqrt{-1}=0$

$$\boldsymbol{b\sqrt{-1} = -a}$$

$$\boldsymbol{\sqrt{-1} = \frac{-a}{b}}$$

$$\therefore \boldsymbol{-1 = \left(\frac{-a}{b}\right)^2} \text{ As } \boldsymbol{a = -b\sqrt{-1}} \text{ or } \boldsymbol{b = \frac{-a}{\sqrt{-1}}}$$

Then since $\boldsymbol{-1 = \left(\frac{-a}{b}\right)^2}$

$$\boldsymbol{-1 = \left(\frac{-(-b\sqrt{-1})}{b}\right)^2}$$

$$\boldsymbol{-1 = \left(1\sqrt{-1}\right)^2}$$

$$\boldsymbol{-1 = (i)^2}$$

$$\boldsymbol{1 + i^2 = 0}$$

$$\boldsymbol{1 - 1 = 0}$$

$$\therefore \boldsymbol{0 = 0}$$

And where on the plane it is equal to negative one, then by substitution it can be argued and reasoned for, that algebra is not just a count of infinities, so as to adhere to real thought or confine the subject of quantities of both trivial, and non-trivial nature to empiricism. It seems, to obey the laws of nature as they are by the Universe. And it can be further declared and verified as it is rewritten and proven as follows:

$$\boldsymbol{\frac{1}{Ax + Bx^{-2}} = -1}$$

$$\boldsymbol{\frac{1}{Ax + Bx^{-2}} = i^2}$$

$$\boldsymbol{\frac{1}{Ax + Bx^{-2}} = \left(\frac{-a}{b}\right)^2}$$

$$\boldsymbol{\frac{\sqrt{1}}{\sqrt{Ax + Bx^{-2}}} = \frac{-a}{b}}$$

$$\boldsymbol{\frac{1}{\sqrt{Ax + Bx^{-2}}} = \frac{-a}{b}}$$

$$\therefore \boldsymbol{b = -a\sqrt{Ax + Bx^{-2}}} \text{ and } \therefore \boldsymbol{a = -\frac{b}{\sqrt{Ax + Bx^{-2}}}}$$

From there it can be reasoned further that $\boldsymbol{log_{\left(\frac{-a}{b}\right)} \frac{1}{Ax + Bx^{-2}} = 2}$, so that since from the ratio where it is one-to-one: then at that point it can be proven deductively that if $\boldsymbol{log_{\left(\frac{z-x}{y}\right)} -1 = 2}$; hence it follows that $\boldsymbol{log_{\left(\frac{-a}{b}\right)} \frac{1}{Ax + Bx^{-2}} = log_{\left(\frac{z-x}{y}\right)} -1}$.

So that given the Gelfond's constant $\boldsymbol{i^{\frac{2}{i}} = e^{\pi}}$; then $\boldsymbol{log_i e^{\pi} = \frac{2}{i}}$

$$\therefore \boldsymbol{i\, log_i e^{\pi} = 2}$$

It then clearly, logically follows that at some point on the complex plane where the value is equal two, the logarithms for such variables in comparison are also equal to each other, and therefore: one-to-one. Then it also holds as follows: $\boldsymbol{i\, log_i e^{\pi} = log_{\left(\frac{-a}{b}\right)} \frac{1}{Ax + Bx^{-2}}}$

$$\boldsymbol{log_i e^{\pi} = \frac{log_{\left(\frac{-a}{b}\right)} \frac{1}{Ax + Bx^{-2}}}{i}}$$

$$\therefore \boldsymbol{i^{\frac{\frac{log_{\left(\frac{-a}{b}\right)} \frac{1}{Ax + Bx^{-2}}}{i}}{i}} = e^{\pi}}$$

Conclusion

By logic- reason is a limit whose value cannot be false, as long as its validity can be proven and verified by a given context or relevance of argument. The result is arrived at when the decision is made upon in which style of reasoning is appropriate for a given context; so that it is either one of the three types of styles mentioned in the introduction. Or both, if not a combination. Yet if otherwise, then it is incoherent, and proving no value except that of the fallacy itself. But since the argument is deduced from the premises which holds that are- by the nature of the plane possible. Then, transformation generalises applicable forms to truth values whose uniformity on the given context cannot be subject to deformation even if corrupted by false values. Therefore, the Gelfond's constant validates the existence of complex numbers which are algebraic derivations of the simple plane. For what algorithms proves is basically, the state of objects as they hold on the plane, and their behaviour as conditions change. And if there exists any limit in algebra. It is the fact that impossible objects can by far be only represented, as constructs of imagination. Hence, those objects whose structure are of a complex nature- are defined outside the bounds of general analysis; which is also applicable on real objects…But also, with regards to their derivation from the axioms themselves that verifies their existence. Therefore, it is proven that the Gaussian theorem holds, and therefore, its truth is confirmed by its existence as generalised by the structure and behaviour of complex numbers.

Reference

[1] Andreescu, T. & Andrica, D., 2005, *Complex numbers from A to…Z*, Springer, New York.

[2] C. G, Gibson, 2003, *Elementary Euclidean Geometry: An introduction,* Cambridge University Press, United Kingdom.

[3] Euler*, L*, 1984, *Elements of algebra,* transl. Rev. J. Hewlett, Springer-Verlag, New York.

[4] Gauss, C, F, 1799, *New proof of the Theorem that Every Algebraic Rational Integral Function In One Variable can be Resolved into Real Factors of the First or the Second Degree*, transl. Prof. E. Fandreyer, Fitchburg State College, Fitchburg.

[5] Needham, T, 2023, *Visual Complex Analysis,* Oxford University Press, United Kingdom.

[6] Riemann, B, 1859, '*On the Number of Prime Numbers less than a Given Quantity*', transl. D. R. Wilkins, Monatsberichte der Berliner Akademie, November, 1- 10.

[7] Samuel, P, 1988, *Projective Geometry*, Springer-Verlag, New York.

[8] Ultrich, L, Rohde, G, Jain, C, Podder, AK & Ghosh, AK, 2012, *Introduction to differential Calculus: Systematic studies with Engineering Applications for Beginners*, New Jersey.