Optimization in Ternary Calculus

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Abstract

A ternary operation on a set S in mathematics is a function $\omega : S \times S \times S \to S$ that maps each ordered triple $(a, b, c) \in S^3$ to an element $\omega(a, b, c) \in S$ This describes a particular example of an n-ary operation for n=3,where the domain is the Cartesian product of three copies of S and the codomain is S itself[1]

Keywords: Optimization Techniques, Cubic Equation

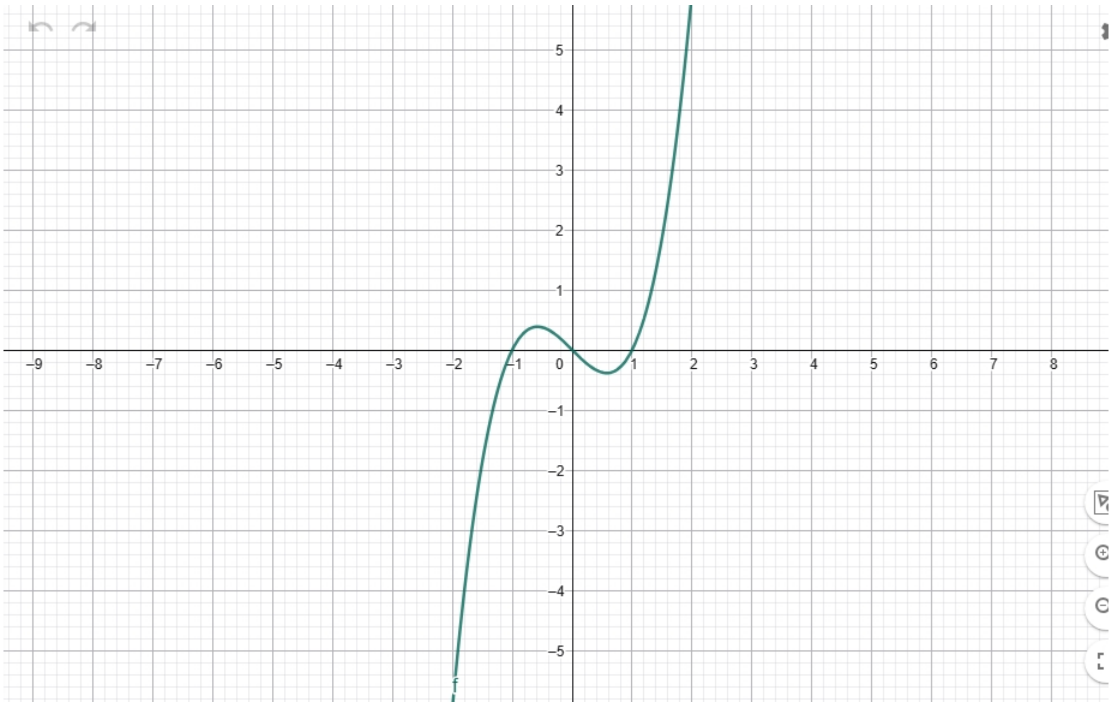
1 General Information

The relation between Ternary set and integer does exist and it can be expressed in the following way:[5]

$$\frac{(n,1)}{(n,2)} \sum_{i=-n}^{n} i = \prod = \omega : |\omega : S \times S \times S \to S \tag{1}$$

2 Further Proof

Further Proof lies in the fact that the Eigenvectorλ can be expressed through a set of numbers $e_1e_2e_3 : |\lambda = e_1, e_2, e_3 \wedge e_1e_2e_3 \sum_{i=0}^{n} a_ib_ic_i = 0$ The aforemention relation allows us to conclude that programming in Ternary Code with subsequent conversion to decimal is, indeed, possible via the sum of suare numbers Optimization in Ternary Calculus can be demonstrated by the following example:



It is not difficult to prove that the graph of the following function corresponds to the equation:

$f(x) = x(x-1)(x+1)$ Solutions to the latter lie along the curve and make it easy to encode/decode numbers by means of the Cube roots: Check: Let 'n' be an integer:$n \in Z$ If we want to establish correspondence between Integers and Ternary componets we will look at the the following equation:

$$a(a-b)(a+b) = a - n \tag{2}$$

$$b = 1 \rightarrow \frac{a^3 - n}{a^3 - a} \tag{3}$$

(see formula (1)) The above reasoning gives us sufficient evidence to conclude that a relation between a Ternary set and Integers can be established by means of a a cubic equation in one variable is an equation of the form $ax^3 + bx^2 + cx + d = 0$ in which d is $d \in Z$

3 Conclusion

Our preliminary research shows that the relation between Ternary set and the set of Integers does exist [3] Cubic formula gives us sufficient evidence to conclude that the morphism between various sets of numbers can be established It is mutual and the fact allows to use that relation for solving out various problems related to computation and engineering[2][4]

References

[1] Noether, Emmy. "Invariant variation problems." Transport theory and statistical physics 1.3 (1971): 186-207.

[2] Pozinkevych, R. (2021). Ternary Mathematics and 3D Placement of Logical Elements Justification. Asian Journal of Research in Computer Science, 11(2), 11-15.

[3] Arnol'd, V. I. (Ed.). (2004). Arnold's problems. Springer.

[4] Huss-Lederman, S., Jacobson, E. M., Tsao, A., Turnbull, T., & Johnson, J. R. (1996, November). Implementation of Strassen's algorithm for matrix multiplication. In Proceedings of the 1996 ACM/IEEE Conference on Supercomputing (pp. 32-es).

[5] Boas, M. L. (2006). Mathematical methods in the physical sciences. John Wiley & Sons.