

Nepalese Mathematical Researcher Miraj Pathak With His Groundbreaking Concepts

The young mathematician's groundbreaking theories provide new frameworks for understanding numerical interactions, bridging abstract number theory with practical mathematical analysis.

Research Article

Pathak's Theory of Number Interaction (PTNI)

Miraj Pathak*

Independent Researcher, Chitwan, Nepal

More Information

*Address for correspondence: Miraj Pathak, Independent Researcher, Chitwan, Nepal, Email: pathakmiraj09@gmail.com

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Abstract

Pathak's Theory of Number Interaction (PTNI) introduces a new idea for understanding how numbers interact. It defines an "interactive strength" between two numbers based on their difference, providing a novel framework for thinking about number relationships with simple mathematical rules applicable to various kinds of numbers.

1. Introduction

We tend to think of numbers in terms of easy operations like adding, subtracting, multiplying, and dividing. But what if we thought of numbers not just in terms of these operations, but in terms of how they interact with each other, like physical bodies pushing or pulling? Pathak's Theory of Number Interaction (PTNI) is a new way of thinking about these interactions.

In PTNI, we define an interactive strength as a function of the difference between two numbers. The bigger the difference, the weaker the interaction. By altering how we define this difference, we can simulate various types of number interactions. Just like forces in physics depend on the distance between objects.

Additionally, the notation for the strength is N , also referred to as Numo-tract.

2. The number interaction theory

To define how two numbers interact, we start with a simple idea: the strength between two numbers depends on their difference. In the same way that physical forces are often described as inversely proportional to distance raised to a power, we begin with the idea:

$$N \propto \frac{1}{|a-b|^n} \tag{1}$$

To convert this proportionality into an equation, we introduce a constant of proportionality, denoted by k , giving us:

$$N(a,b) = \frac{k}{|a-b|^n} \tag{2}$$

Here:

- a and b are the two numbers we are comparing.
- k is a constant that scales the interactive strength.
- n is an exponent that tells us how quickly the interaction gets smaller as the difference increases.
- $|a - b|$ is the absolute difference between the numbers, always positive.

This formula tells us that the interactive strength gets weaker when the numbers are farther apart. The exponent n tells us how quickly the strength decays as the difference increases [1].

3. Special cases

There are some interesting cases where the interaction behaves in unique ways.

3.1. When one number is very small

If one number becomes very small, say $a \rightarrow 0$, and b is much larger than a , the difference $|a - b|$ approaches $|b|$, and the strength behaves as follows:

$$N(0,b) = \frac{k}{|0-b|^n} = \frac{k}{|b|^n} \tag{3}$$

Thus, as a approaches zero, the strength between 0 and b behaves similarly to the strength between b and any small number. The magnitude of the interaction depends on b raised to the power n .

3.2. When one number is very large

If one number is much larger than the other, the difference

Kathmandu, Bagmati Feb 11, 2026 ([IssueWire.com](http://www.IssueWire.com)) - Miraj Pathak, an independent mathematical researcher based in Nepal, is causing a sensation in the realm of number theory and theoretical mathematics because of his pioneering studies on the interaction of numbers.

Pathak is the founder of Miraj's Cubo and Miraj's Numo, which are new algebraic identities representing the sum and difference of powers equated to the differences of squares through a new parameter termed Miraj's Change. These papers are already published by international journals like International Journal of Advanced Research [Miraj's Cubo - Int. J. Adv. Res. 13\(03\), 20-23](#) and Annals of Mathematics and Physics [Miraj's Numo - Ann Math Phys. 2025;8\(4\):117-120](#). His papers are also listed in renowned academic library catalogs worldwide, including Harvard University Library (HOLLIS) [Harvard Hollis Library - Miraj Pathak](#), The Royal Library of Denmark [DET KGL BIBLIOTEK] [The Royal Library, Denmark - Miraj Pathak](#), National University of Singapore Library, University of Washington Libraries, and WorldCat.

Continuing the work built on these achievements, Pathak developed the Pathak Theory of Number Interaction (PTNI) based on the idea of Interact, which encompasses the measurement of the interaction potential of numbers. It also came up with the equation for net strength, which allows for mathematical treatment of the subject. PTNI has been published and recognized internationally in various journals, including the International Journal of Physics Research and Applications [Pathak's Theory of Number Interaction - Int J Phys Res Appl. 2025; 8\(6\): 169-171](#). Taking the subject and developments one step ahead, the author has come up with the hypothesis for Pathak Continuum Compression (PCCH) and is still working in this field.

Besides his research activities, Pathak has achieved great success in competitive examinations within Nepal, achieving the prestigious award of All Nepal Rank 7 in the National Mathematics Olympiad competition. He has also been a finalist in the 12th National Astronomy Olympiad competition conducted by the Nepal Astronomical Society, receiving the prestigious award of All Nepal Rank 28. Furthermore, he has also appeared in the prestigious CIERA REACH Program in the USA, under a full scholarship in the field of research in theoretical physics and astrophysics.

"Pathak continues his pursuit of original theoretical research while seeking to make the abstract mathematics both applicable and relevant. His research not only contributes in a meaningful way to the field of number theory, but it also positions the young scholar as a leader and authority who is capable of making a global impact within the discipline and beyond."



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RESEARCH ARTICLE
MIRAJ'S CUBIC: A COMPREHENSIVE EXPLORATION OF RELATION OF CUBIC IDENTITIES WITH SQUARE NUMBERS
 Miraj Pathak
 Chitwan, Nepal

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Abstract
 In this paper, I will introduce Miraj's Cubic, which is a pioneering mathematical identity that presents an intriguingly new look at the sum of cubes. We all know the conventional way to express the sum of cubes $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$, which is a combination of algebra, usually used in polynomial factorization, equation solving, and mathematical proofs (Hardy & Wright, 1979). While this classical identity has been valuable in a lot of times, its form has remained largely static, leaving room for alternative explorations. In this work, I reimagined the sum of cubes in an entirely new light by expressing it as a difference of squares: $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$, where the parameter m , called Miraj's Change, plays an important role in the following transformation. It is defined as $m = (a+b)(1-3ab/4)$. This parameter encodes the relationship between a and b , which changes with the change in their respective values. The introduction of m makes the new formula not only present an alternative way of expressing the sum of cubes but also allow for a more intricate relationship between the two terms. Implications of this discovery are immense. In this paper, I have shown a detailed derivation and validation of Miraj's Cubic, which shows how this transformation takes advantage of the elegance and simplicity of the difference of squares to offer new pathways for algebraic manipulation and computation. I delve into the theoretical underpinnings of m and how it balances the contributions of a and b in cubic identities, with the potential to shed light on new algebraic relationships. It will find broad applications both theoretically and practically. Theoretically, the new tools for polynomial identity analysis given by Miraj's Cubic provide insights into their geometric and algebraic properties. On a practical level, it holds great promise for simplifying complex computations, particularly in number arithmetic and in algorithmic contexts where the representation of differences of squares has significant computational advantages. Besides its mathematical utility, Miraj's Cubic has pedagogical value, serving as a novel teaching tool for advanced algebra. The ability to link cubic and quadratic identities provides a fresh avenue for students to deepen their understanding of algebraic relationships. In the final analysis, this paper not only presents a new mathematical identity but also redefines the way I approach and interpret the sum of cubes. This identity has

Corresponding Author:- Miraj Pathak
 Address:- Chitwan, Nepal.

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Research Article
Miraj's Numo: Generalized Algebraic Identity for the Sum and Difference of Powers
 Miraj Pathak*

Independent Researcher, Chitwan, Nepal

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 *Corresponding author: Miraj Pathak, Independent Researcher, Chitwan, Nepal.
 Email: pathakmiraj@gmail.com

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Abstract
 This paper is concerned with the generalization of Miraj's Numo, a novel algebraic identity that connects the sum and difference of small powers into differences of squares. The method begins by identifying a parameter m that depends upon the ratio of the powers so that the transformation yields for any two real numbers a, b , and an integer exponent n . We present a rigorous derivation, along with illustrative cases, to show the Miraj's Numo generalizes classic identities and connects expressions to integer forms, in the realm of integer factors, the identity opens a new viewpoint to approach polynomial equations and factorization problems and may be of assistance in simplifying computations in higher algebra and number theory. With Miraj's Numo's form that links into hidden structures within power sums these become a path towards applications in such research areas as computational algebra, and formal verification, where such algebraic manipulations find their natural application.

1. Introduction
 The sum of powers, $a^n + b^n$, has been a subject of interest in algebra for centuries. Various identities have been proposed to simplify such sums for specific powers, such as cubes and squares. However, these identities are often limited in scope and do not generalize well for all values of $n > 2$. My paper presents Miraj's Numo, as a generalized algebraic formula that expresses the sum of two odd powers as a difference of squares for all integer values of $n > 2$.

The significance of Miraj's Numo lies in its versatility and generalization. By introducing a custom parameter, m , which varies based on the value of n , we are able to express the sum of powers $a^n + b^n$ in a compact and elegant form. This identity not only unifies previous results for specific powers but also extends them to an infinite range of integer values for n , covering both positive and negative components (1,1).

But what's really new about Miraj's Numo is that you finally get a general way to express the sum or difference of two odd powers as a difference of squares, for each separate

integer exponent $n > 2$. something old identity like Sophie Germain's or sum of cubes only did for special cases, unlike traditional formulas confined to specific powers. Miraj's Numo breaks these boundaries, introducing a flexible parameter m , that adapts dynamically, enabling a unified, elegant, and broad-reaching identity. This not only deepens our algebraic understanding but opens new doors for applications in number theory, polynomial factorization, and computational algebra.

2. Derivation of Miraj's Numo
 To derive Miraj's Numo, we begin with the following identity for the difference of squares:

$$x^2 - y^2 = (x + y)(x - y)$$

 We aim to express $a^n + b^n$ and $a^n - b^n$ in a similar form. By strategically defining an auxiliary parameter m , we construct a difference of squares. This is the core idea behind Miraj's Numo:

$$a^n + b^n = (a^m + b^m) \left[\frac{a^{n-m} + b^{n-m}}{2} \right] - \left[\frac{a^{n-m} - b^{n-m}}{2} \right]^2$$

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Media Contact

Miraj Pathak

*****@gmail.com

9845150967

Bharatpur 9 Chitwan Nepal

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