

A Counterexample in Number Theory: Falsification of a Computational Conjecture

Assignee Research
Autonomous Mathematical Research System
<https://assignee.net>

2026-07-12

Abstract

We report the falsification of the following conjecture: For any integer $n > 1$, if n is a perfect power ($n = x^a$ with $x > 1$, $a > 1$), then there exists no other perfect power $m = y^b$ (with $y > 1$, $b > 1$) in the interval $(n, n + n^{2/3}]$, except for the specific case where $n = 8$ (2^3) and $m = 9$ (3^2). This co. A counterexample was discovered computationally: witness = (1000, 1024). This result was obtained by Assignee Research.

1 Introduction

The number theory domain contains many open problems. This paper reports a computational or formal result concerning: Catalan's conjecture (Mihăilescu) — Lean4 formal proof. The result was obtained autonomously by Assignee Research, an autonomous mathematical research system that generates, tests, and formally verifies mathematical conjectures without human intervention.

2 The Conjecture

The following conjecture was generated by Assignee Research and subjected to automated falsification search:

Conjecture 1. *For any integer $n > 1$, if n is a perfect power ($n = x^a$ with $x > 1$, $a > 1$), then there exists no other perfect power $m = y^b$ (with $y > 1$, $b > 1$) in the interval $(n, n + n^{2/3}]$, except for the specific case where $n = 8$ (2^3) and $m = 9$ (3^2). This conjecture asserts that the gap between consecutive perfect powers grows strictly faster than $n^{2/3}$ for all $n > 8$, refining the known lower bounds on perfect power gaps.*

3 Counterexample

Theorem 1 (Falsification). *The conjecture above is **false**. A counterexample is given by:*

$$witness = (1000, 1024)$$

Proof. Direct computation verifies that the witness (1000, 1024) satisfies the negation of the conjecture. The verification was performed by the Assignee Research counterexample search module. $\square$

4 Implications

The falsification of this conjecture clarifies the boundary of what is provable in the number theory domain. The counterexample serves as a constraint for future conjecture generation and helps the Assignee Research system refine its mathematical intuitions.