

A Counterexample in Number Theory: Falsification of a Computational Conjecture

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

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Abstract

We report the falsification of the following conjecture: For every Fibonacci prime F_p with index $p > 3$, the quantity $(p-1)/2$ is a prime number. In other words, the indices of Fibonacci primes greater than 2 are either 4 or twice a prime (Sophie Germain prime structure in the index).. A counterexample was discovered computationally: witness = 4. 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: Fibonacci primes — density conjecture. 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 every Fibonacci prime F_p with index $p > 3$, the quantity $(p-1)/2$ is a prime number. In other words, the indices of Fibonacci primes greater than 2 are either 4 or twice a prime (Sophie Germain prime structure in the index).*

3 Counterexample

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

$$\text{witness} = 4$$

Proof. Direct computation verifies that the witness 4 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.