SHOW AND GIVE INFINITELY MANY PAIRS OF TWIN PRIMES OF THE FORM \{2 \cdot 6^k \pm 1, \; k \in \mathbb{N}\}

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Abstract: With observations and speculation, this article puts forward a proposition about twin primes that every pair of numbers of the form \{2 \cdot 6^k \pm 1, \; k \in \mathbb{N}\} all be twin primes. Proves the proposition statement is true applied Wilson’s theorem and induction, show there are infinitely many twin primes of the form \{2 \cdot 6^k \pm 1, k \in \mathbb{N}\}, and conclude the twin prime conjecture statement is true.

Keywords: Twin primes; Wilson’s theorem; Induction; The twin prime conjecture

“I think that only daring speculation can lead us further----- and not accumulation of facts.” Albert Einstein

“The moving power of mathematical invention is not reasoning ------------ but imagination.”

Augustus de Morgan

1. Introduction

The twin prime conjecture[1] is a beautiful open problem in Number Theory about primes, a pair of primes are called twin primes such as \{11,13\}, \{29,31\} or \{101,103\} of the form \{p, p+2\}, and the twin prime conjecture states that there exist infinitely many primes p such that p+2 is also prime.

In the article, puts forward a proposition about twin primes, proves the proposition statement is true applied Wilson’s theorem and induction, show there are infinitely many twin primes of the form \{2 \cdot 6^k \pm 1, k \in \mathbb{N}\}, and conclude the twin prime conjecture statement is true.

By observing, with intuition and imagine, draw the following speculation:

Proposition For every positive integer k, each and every pair of numbers of the form

(i) \{2 \cdot 6^k \pm 1\};    (ii) \{3 \cdot 6^k \pm 1\};    (iii) \{5 \cdot 6^k \pm 1\};    (iv) \{7 \cdot 6^k \pm 1\}.

All is twin primes.
Theorem For every positive integer $k$, each and every pair of numbers of the form

$$\{2 \cdot 6^k \pm 1\}$$

All is twin primes.

2. Proof of the Theorem

Theorem

Proof.

This completes the proof of the Theorem. \hfill \Box

3. Conclusion

By the Theorem statement, we have

There exist infinitely many primes \((2 \cdot 6^k - 1)\) such that \((2 \cdot 6^k + 1)\) is also prime.

Up to now, we proved that the twin prime conjecture statement is true.

References