

The New Prime theorem (12)

$$3 \times a^3 \pm 1$$

Chun-Xuan Jiang

P. O. Box 3924, Beijing 100854, P. R. China

jiangchunxuan@vip.sohu.com

Abstract: Using Jiang function we prove that $3 \times a^3 \pm 1$ has infinitely many prime solutions.

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Theorem. We define the prime equation

$$P_1 = 3 \times (P-1)^3 + 1 \quad (1)$$

There exist infinitely many primes P such that P is a prime.

Proof. We have Jiang function[1]

$$J_2(\omega) = \prod_P [P-1 - \chi(P)] \quad (2)$$

where $\omega = \prod_P P$, $\chi(P)$ is the number of solutions of congruence

$$3 \times (q-1)^3 + 1 \equiv 0 \pmod{P}, \quad q = 1, \dots, P-1 \quad (3)$$

we have

$$3^{\frac{P-1}{3}} \equiv 1 \pmod{P} \quad (4)$$

If (4) has a solution then $\chi(P) = 3$. If (4) has no solution then $\chi(P) = 0$, $\chi(P) = 1$ otherwise.

We prove $J_2(\omega) \neq 0$, there exist infinitely many primes P such that P_2 is a prime.

We have asymptotic formula [1]

$$\pi_2(N, 2) = \left| \left\{ P \leq N : 3 \times (P-1)^3 + 1 = \text{prime} \right\} \right| \sim \frac{J_2(\omega)\omega}{3\phi^2(\omega)} \frac{N}{\log^2 N} \quad (5)$$

where $\phi(\omega) = \prod_P (P-1)$

In the same way we are able to prove that $3 \times a^3 - 1$ has infinitely many prime solutions.

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Author in US address:

Chun-Xuan Jiang

Jiangchunxuan@vip.sohu.com

Institute for Basic Research Palm Harbor, FL 34682, U.S.A.

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