The New Prime theorem（21）

Hardy-Littlewood conjecture A:

Binary Goldbach conjecture and $N = P_1 + \cdots + P_n$

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Abstract

Using Jiang function we prove binary Goldbach conjecture and $N = P_1 + \cdots + P_n$ [4].

Theorem. We define prime equation

$$N = P_1 + \cdots + P_n, \quad (1)$$

N and n are both odd numbers, or N and n are both even numbers. Every integer N is a sum of n odd primes.

Proof. We have Jiang function [1,2]

$$J_n(\omega) = \prod_{3 \le P} \left(\frac{(P-1)^n - (-1)^n}{P} \right) \prod_{P|N} \left(1 + \frac{(-1)^n P}{(P-1)^n - (-1)^n} \right) \ne 0, \quad (2)$$

We have asymptotic formula [1,2]

$$\pi_2(N,n) = \left| \{ P_1, \cdots, P_{n-1} < N : P_n = prime \} \right| \sim \frac{J_n(\omega)\omega}{(n-1)!\phi^n(\omega)} \frac{N^{n-1}}{\log^n N}, \quad (3)$$

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

Theorem 1. Hardy-Littlewood conjecture A: binary Goldbach conjecture[4]. Every even number $N > 4$ is a sum of two odd primes.

Let $n = 2$. From (1) we have

$$N = P_1 + P_2. \quad (4)$$

From (2) we have

$$J_2(\omega) = \prod_{3 \le P} (P-2) \prod_{P|N} \frac{P-1}{P-2} \ne 0. \quad (5)$$

We prove that every even number $N > 4$ is a sum of two odd primes.

From (3) we have asymptotic formula

$$\pi_2(N,2) = \left| \{ P_1 < N : N - P_1 = priime \} \right| \sim \frac{J_2(\omega)}{\phi^2(\omega)} \frac{N}{\log^2 N} = 2 \prod_{3 \le P} \left(1 - \frac{1}{(P-1)^2} \right) \prod_{P|N} \frac{P-1}{P-2} \frac{N}{\log^2 N}. \quad (6)$$

Theorem 2. The ternary Goldbach conjecture. Every odd number $N > 7$ is a sum of three odd primes, Let $n = 3$. From (1) we have

$$N = P_1 + P_2 + P_3. \quad (7)$$

From (2) we have Jiang function

$$J_3(\omega)=\prod_{3\le P}(P^2-3P+3)\prod_{P|N}\left(1-\frac{1}{P^2-3P+3}\right)\ne 0. \quad (8)$$

We prove that every odd number $N>7$ is a sum of three odd primes.
From (3) we have asymptotic formula

$$\pi_2(N,3)=\left|\{P_1,P_2<N: N-P_1-P_2=priime\}\right|\sim\frac{J_3(\omega)\omega}{2\phi^3(\omega)}\frac{N}{\log^3 N}$$

$$=\prod_{3\le P}\left(1+\frac{1}{(P-1)^3}\right)\prod_{P|N}\left(1-\frac{1}{P^3-3P+3}\right)\frac{N^2}{\log^3 N}. \quad (9)$$

Remark. The prime number theory is basically to count the Jiang function $J_{n+1}(\omega)$ and Jiang prime k-tuple singular series $\sigma(J)=\frac{J_2(\omega)\omega^{k-1}}{\phi^k(\omega)}=\prod_P\left(1-\frac{1+\chi(P)}{P}\right)(1-\frac{1}{P})^{-k}$ [1,2], which can count the number of prime number. The prime distribution is not random. But Hardy prime k-tuple singular series $\sigma(H)=\prod_P\left(1-\frac{\nu(P)}{P}\right)(1-\frac{1}{P})^{-k}$ is false [3-8], which can not count the number of prime numbers.

References

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Szemerédi's theorem does not directly to the primes, because it can not count the number of primes. It is unusable. Cramér's random model can not prove prime problems. It is incorrect. The probability of $1/\log N$ of being prime is false. Assuming that the events "P is prime", "$P+2$ is prime" and

“ $P+4$ is prime” are independent, we conclude that P, $P+2$, $P+4$ are simultaneously prime with probability about $1/\log^3 N$. There are about $N/\log^3 N$ primes less than N. Letting $N \to \infty$ we obtain the prime conjecture, which is false. The tool of additive prime number theory is basically the Hardy-Littlewood prime tuple conjecture, but can not prove and count any prime problems[6].