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The twin primes' infinite rule

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Abstract. In this paper, the rule of infinite twin primes is found. Generally speaking, the superposition of twin primes produces a third pair. A pair of twin primes plus a pair of twin primes produces a third pair, Starting with the third pair of twin prime pairs, for each pair of twin prime pairs, two pairs of twin prime pairs can always be found in the preceding pair, such that their sum is equal to the sum of this pair of twin prime pairs; Or from the second pair of twin primes (an,bn), at least one pair of twin primes can always be found in front of it, such that their sum is equal to the sum of some pair of twin primes following this pair (an,bn).

Keywords: Twin prime, infinite rule, number theory.

1. Introduction

The twin prime conjecture[1] is a famous unsolved problem in number theory. This conjecture was formally proposed by Hilbert in his eighth question on the twin primes conjecture, presented at the International Congress of Mathematicians in 1900, twin primes are pairs of primes that differ by 2, such as 3 and 5,5 and 7,11 and 13... . The twin prime conjecture was formally proposed by Hilbert in question no. 8 of his report to the International Congress of Mathematicians in 1900 and can be described as follows:

There are infinitely many prime p such that p + 2 is prime.A prime pair (p, p + 2) is called a twin prime.The prime number theorem explains the tendency of prime numbers to become rare as they approach infinity. Twin prime numbers, like prime numbers, have the same trend, and this trend is more obvious than prime numbers.

Due to the high popularity of the twin prime conjecture and its connection with Goldbach's conjecture, there are a number of mathematical enthusiasts outside the academic community trying to prove it. Some people claim to have proved the twin prime conjecture. However, no proof has emerged that can be examined by professional mathematicians.

In 1849, French mathematician Alphon Polignac proposed the "Polignac conjecture" : for all natural numbers K, there are infinitely many pairs of prime numbers (p,p+ 2K). When k is equal to 1, it is the twin prime conjecture, and when K is equal to other natural numbers, it is called the weak twin prime conjecture (a weakened version of the twin prime conjecture). Therefore, some people put forward the twin prime number conjecture Polignac.

Since then, the intrinsic appeal of these guesses has earned them the title of mathematical holy grail, even though they may have no practical application. Although many mathematicians have tried to prove the conjecture, they cannot rule out the possibility that the interval between prime numbers will keep growing and eventually exceed a certain upper limit.

In 1921, British mathematicians Godfrey Hardy and John Littlewood proposed a conjecture similar to the Polignac conjecture, often referred to as the "Hardy-Littlewood conjecture" or the "strong twin prime conjecture" (i.e. an enhanced version of the twin prime conjecture). This conjecture not only suggests that there are infinitely many pairs of twin prime numbers, but also gives the asymptotic distribution. Chinese mathematician Zhou Haizhong pointed out that to prove the strong twin prime conjecture, people still face many great difficulties.

In 1849, Alphonse de Polignac proposed a more general conjecture: for all natural numbers K, there are infinitely many pairs of prime numbers (p,p + 2k). The k= 1 case is the twin prime conjecture.

The sieve was obtained in 1966 by the late Chinese mathematician Chen Jingrun using the Sieve method. Chen jingrun proved that there are infinitely many prime numbers p, such that P +2 is either a prime number or the product of two prime numbers. This result is similar to his result for

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the Goldbach conjecture. It is generally considered that this result is difficult to be surpassed within the screening range due to the limitations of the screening method itself.

On May 14, 2013, "natural" (Nature) magazine reported online yitang zhang proved that "there are an infinite number of primes less than 70 million for" poor, this study was considered in the twin prime conjecture has achieved a major breakthrough in the ultimate number theory problem, even some people think that their impact on the community will be more than the "1 + 2" trained Chen jingrun proved. In his latest study, Zhang yitang, without relying on unproved inferences, found that there are infinitely many pairs of prime numbers whose difference is less than 70 million, thus taking a big step forward in the important question of the twin prime conjecture.

In this paper, we find the rule of infinite twin prime numbers, but we can not give a strict proof, but we can confirm the confidence of infinite twin prime numbers to prove the conjecture, rather than disprove it.

The frequency of 4n+1 primes before k is less than 4n-1 primes

Write the twin primes up to 5000 in order:

{3,5},{5,7},{11,13},{17,19},{29,31},{41,43},{59,61},{71,73},{101,103},{107,109},

{137,139},{149,151},{179,181},{191,193},{197,199},{227,229},{239,241},{269,271},{281,283},{311,313},{347,349},{419,421},{431,433},{461,463},{521,523},{569,571},{599,601},{617,619},{641,643},{659,661},{809,811},{821,823},{827,829},{857,859},{881,883},{1019,1021},{1031,1033},{1049,1051},{1061,1063},{1091,1093},{1151,1153},{1229,1231},{1277,1279},{1289,1291},{1301,1303},{1319,1321},{1427,1429},{1451,1453},{1481,1483},{1487,1489},{1607,1609},{1619,1621},{1667,1669},{1697,1699},{1721,1723},{1787,1789},{1871,1873},{1877,1879},{1931,1933},{1949,1951},{1997,1999},{2027,2029},{2081,2083},{2087,2089},{2111,2113},{2129,2131},{2141,2143},{2237,2239},{2267,2269},{2309,2311},{2339,2341},{2381,2383},{2549,2551},{2591,2593},{2657,2659},{2687,2689},{2711,2713},{2729,2731},{2789,2791},{2801,2803},{2969,2971},{2999,3001},{3119,3121}, {3167,3169},{3251,3253},{3257,3259},{3299,3301},{3329,3331},{3359,3361},{3371,3373},{3389,3391}{3461,3463},{3467,3469},{3527,3529},{3539,3541},{3557,3559},{3581,3583},{3671,3673},{3767,3769},{3821,3823},{3851,3853},{3917,3919},{3929,3931},{4001,4003},{4019,4021},{4049,4051},{4091,4093},{4127,4129},{4157,4159},{4217,4219},{4229,4231},{4241,4243},{4259,4261},{4271,4273},{4337,4339},{4421,4423},{4481,4483},{4517,4519},{4547,4549},{4637,4639},{4649,4651},{4721,4723},{4787,4789},{4799,4801},{4931,4933},{4967,4969}.

Add each set of twin primes and divide by 2, and you get

4,6,12,18,30,42,60,72,102,108,138,150,180,192,198228,240,270,282,312,348,420,432,462,522,570,600,618,642,660,810,822,828,858,882,1020,1032,1050,1062,1092,1152,1230,1278,1290,1302,1320,1428,1452,1482,1488,1608,1620,1668,1698,1722,1788,1872,1878,1932,1950,1998,2028,2082,2088,2112,2130,2142,2238,2268,2310,2340,2382,2550,2592,2658,3300,3330,3360,3372,3390,3462,3468,3528,3540,3558,3582,3672,3768,3822,3852,3918,3930,4002,4020,4050,4092,4128,4158,4218,4230,4242,4260,4272,4338,4422,4482,4518,4548,4638,4650,4722,4788,4800,4932,4968.

Rules found:

18=6+12,30=12+18,42=30+12,60=42+18,72=60+18,102=72+30,108=102+6,
138=108+30,150=138+12,180=150+30,192=180+12,198=192+6,228=198+30,240=228+12,270=240+30,282=270+12,312=282+30,348=240+108,420=348+72,432=420+12,462=432+30,522=462+60,570=462+108,600=570+30,618=600+18,642=600+42,660=642+18=618+42,810=660+150,822=810+12,828=822+6,858=828+30,882=822+60,1020=828+192,1032=1020+12,1050=1020+30,1062=1050+12,1092=1062+30,1152=1092+60,1230=1092+138,1278=858+420,1290=1278+12=1230+60,1302=1290+12,1320=1302+18,1428=1320+108,1452=1302+150,1482=1452+30,1488=1482+6,1608=180+1428,1620=1608+12,1668=1608+60,1698=1668+30, 1722=1152+570=1620+102,

1788=1608+180,1872=1722+150,1878=1872+6=1698+180,1932=1872+60,1950=1932+18,1998=1428+570,2028=1998+30,2082=1932+150,2088=2082+6,2112=2082+30,2130=2112+18,2142=2130+12,2238=2130+108,2268=2238+30,2310=2268+42,2340=2310+30,2382=2340+42,2550=2310+240,2592=2550+42,2658=2550+108,3300=642+2658,3330=3300+30,3360=3330+30,3372=33

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60+12,3390=3372+18,3462=72+3390,3468=3462+6,3528=3468+60,3540=3528+12,3558=3540+18,3582=3540+42,3672=282+3390,3768=3672+6,3822=150+3672,3852=3822+30,3918=3768+150,3930=3918+12,4002=3930+72,4020=4002+18,4050=4020+30,4092=4050+42,4128=4020+108,4158=4128+30,4218=4158+60,4230=4218+12,4242=4230+12,4260=4242+18,4272=4260+12,4338=4230+108,4422=4272+150,4482=4422+60,4518=180+4338,4548=4518+30,4638=420+4218,4650=4638+12,4722=4650+72,4788=4722+60,4800=4788+12,4932=282+4650,4968=4788+180.

A general description of a law or conjecture

Rule 1：For twin primes(a1, b1), (a2, b2), ..., (an, bn), ..., forn≥3, Then there are two unequal natural numbers i and j between 1 and n-1, make: (an+bn)÷2=(ai+bi)÷2+(aj+bj)÷2, it is an+bn=(ai+bi)+(aj+bj), That is, starting with the third pair of twin primes, the sum of each pair is equal to the sum of the two pairs of twin primes before it.

That is: starting from the third pair of twin primes, for each pair of twin primes, two pairs of twin primes can always be found in the preceding pair, such that their sum is equal to the sum of the pair of twin primes.

Since no strict proof is given, the rule is tentatively called rule 1.

Rule 2 :For every pair of twin primes (an, bn) that starting from the second pair, at least one pair of twin primes precedes it, assuming (ak, bk) , can get new twin prime (an+1,bn+1) or (an+i,bn+i) (i>1) , which meeted (an+bn)+(ak+bk)=an+1+bn+1 or (an+bn)+(ak+bk)=an+i+bn+i.

That is, for every pair of twin primes (an,bn) that starting from the second pair, at least one pair of twin primes can always be found in front of it, so that their sum is equal to the sum of some pair of twin primes following this pair (an,bn).

2. Conclusion

Rule 2 is actually another way of describing law 1. If rule 2 is true, then the last known pair of twin primes, plus a previous pair of twin primes, can always produce a larger pair of twin primes, and so on, we can know that the number of twin primes is infinite!

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