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A Goldbach Conjecture Using Twin Primes

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Abstract. The numbers $2N = 2(2)1000000$ are checked to determine if they can be written as the sum of two twin primes. Thirty-three numbers are found that cannot be so represented; they are all less than 5000. The largest number in the range $2N = 2(2)500000$ that can be written as the sum of two twin primes in only one way is $2N = 24098$.

A natural extension of the Goldbach conjecture is to use only a restricted set of primes instead of all the primes. The primes used could be of a special form, or have special properties. This note describes the case where the allowed primes are twin primes (3, 5, 7, 11, 13, 17, ...).

Define $H(N)$ to be the number of decompositions of N into two twin primes. If a Goldbach type conjecture were to be true about twin primes, then the $H(N)$ function would have no zeros. Unfortunately, in the range $N = 2(2)500000$, $H(N)$ is equal to zero for the following values of N:

94	96	98	400	402	404
514	516	518	784	786	788
904	906	908	1114	1116	1118
1144	1146	1148	1264	1266	1268
1354	1356	1358	3244	3246	3248
4204	4206	4208			

A further computation found no additional zeros of $H(N)$ for N in the range 500000(2)1000000. It is easy to show that if $H(6N) = 0$ then $H(6N - 2) = H(6N + 2) = 0$. This explains, somewhat, why the zeros of $H(N)$ come in threes.

Some interesting numbers concerning the $H(N)$ function: the smallest N for which $H(N) = 1000$ is $N = 30240$, the largest N such that $H(N) = 1$ is $N = 24098$.

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