On The Prime Equatons: $P, jP+9-j(j=1,2,4,5,7,8)$

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Abstract: Using Jiang function we prove that there exist infinitely many primes P such that each $jP+9-j$ is a prime.

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Theorem

$$P, jP+9-j(j=1,2,4,5,7,8) \tag{1}$$

There exist infinitely many primes P such that each of $jP+9-j$ is a prime.

Proof. We have Jiang function[1]

$$J_2(\omega)=\prod_P[P-1-\chi(P)], \tag{2}$$

where $\omega=\prod_P P$,

$\chi(P)$ is the number of solutions of congruence

$$\Pi(jq+9-j)(j=1,2,4,5,7,8)\equiv 0 \pmod P \tag{3}$$

$$q=1,\cdots,P-1.$$

From (3) we have $\chi(2)=0$, $\chi(3)=1$, $\chi(5)=3$, $\chi(7)=3$, $\chi(P)=6$ otherwise.

From (3) and (2) we have

$$J_2(\omega)=3\prod_{11\le P}(P-7)\neq 0. \tag{4}$$

We prove that there exist infinitely many primes P such that $jP+9-j$ is a prime.

We have the best asymptotic formula [1]

$$\pi_7(N,2)=\left|\{P\le N: jP+9-j=prime\}\right|\sim\frac{J_2(\omega)\omega^6}{\phi^7(\omega)}\frac{N}{\log^7 N}, \tag{5}$$

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

Note:

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