Every large prime must lie on a Diriclet's arithmetic sequence and a simple method to identify such arithmetic progressions

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Abstract: Dirichlet's theorem establishes that every arithmetic progression of the form a+nb where gcd(a,b)=1 contains infinitely many primes for positive integers a and b and n=1,2,3,4,………. . We show a simple proof for the existence of such an arithmetic progression for every large prime. This also reveals a method to identify arithmetic progressions on which a particular prime will appear.

Results:

Let p be a very large prime. Then there must exists primes $p_1,p_2,\ldots\ldots,p_k$ that are less than p. Therefore for every such prime we may express p as the following combination of positive integers

$p=p_1q_1+r_1$ such that $0<r_1<p_1$
$p=p_2q_2+r_2$ such that $0<r_2<p_2$

……………………

$p=p_kq_k+r_k$ such that $0<r_k<p_k$

Each of these expressions for p represent an arithmetic progression of the form a+nb where $a=r_i$, $b=p_i$ and $n=q_i$ and where $i=1,2,\ldots,k$

Alternatively we can also consider the arithmetic progressions where $a=r_i$, $n=p_i$ and $b=q_i$ where $i=1,2,\ldots,k$

For every p_i,q_i,r_i, $\gcd(p_i,q_i,r_i)=1$

Thus every large prime must lie on a Diriclet's arithmetic sequence.