

A Proof of Infinite Primes

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It is well a established fact that there are infinitely many prime numbers. The first proof of this fact was given by Euclid. There are other proofs of the fact . I am going to give yet another very simple proof of infinitude of primes.

My proof is based on two accepted facts :

- (1) The fact that natural numbers are infinite.
- (2) **The Prime factorization Theorem** , which says that every positive integer can be written uniquely as a product of prime numbers.

Now consider that prime numbers are finite. Then, there must be some greatest prime number, say 'p'. So the set of prime numbers, (Say, P), will be a finite set. Now , consider the set of numbers N', whose elements are created by taking product of all possible combinations of the elements of 'P'. Since 'P' is finite, N' must also be finite. On the other hand, from Prime factorization theorem, the set 'N' of natural numbers is nothing but the set of product of all possible combinations of the elements of set 'P' of all primes. But 'N' is infinite and can never be same as the finite set N'. So we arrive at a contradiction. Our supposition that *prime numbers are finite*, must be wrong!