Proof 6

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Prove that the only prime triple (i.e. three primes, each 2 from the next) is 3, 5, 7.

Proof

By contradiction.

Let $n \in \mathbb{N}$ be a number such that $n, n + 2, n + 4$ are prime triples.

But, from **Proof 5**, we know that, for any integer n, at least one of $n, n+2, n+4$ is divisible by 3.

Therefore, at least one of the integers $n, n + 2, n + 4$ cannot be a prime (by the definition of a prime). And consequently, they cannot be a prime triple. **Contradiction.**

Hence, our initial assumption was false, and $\{3, 5, 7\}$ are the only prime triple. Boom!