1. Example Section

Theorem 1.1. *There are infinitely many primes*

Proof. Suppose that $p_1 < p_2 < \cdots < p_n$ are all of the primes. Let $P = 1 + \prod_{i=1}^{n} p_i$ and let p be a prime dividing P.

Then p can not be any of p_i, for otherwise p would divide the difference $P - (\prod_{i=1}^{n} p_i) - 1$, which is impossible. So this prime p is still another prime, and $p_1, p_2, \ldots p_n$ cannot be all of the primes. □

Exercise 1.2. *Give an alternative proof that there are an infinite number of prime numbers.*

To solve this exercise, we first introduce the following lemma.

Lemma 1.3. *The Fermat numbers $F_n = 2^{2^n} + 1$ are pairwise relatively prime.*

Proof. It is easy to show by induction that

$$F_m - 2 = F_0 F_1 \ldots F_{m-1}.$$

This means that if d divides both F_n and F_m (with $n < m$), then d also divides $F_m - 2$. Hence, d divides 2. But every Fermat number is odd, so d is necessarily one. This proves the lemma. □

We can now provide a solution to the exercise.

Theorem 1.4. *There are infinitely many prime numbers (Goldbach's proof)*

Proof. Choose a prime divisor p_n of each Fermat number F_n. By the lemma we know these primes are all distinct, showing there are infinitely many primes. □

2. LaTeX examples

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python latex2markdown.py latex.tex markdown.md
cat latex.tex | python latex2markdown.py > markdown.md
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(1) Example list item
(2) Another list item