Fermat + Coq: FLT from Global Normalization at Base 2 (GN(2))

We present a *global-normalization* (explicit-base) reading of G. L. Dedenko's manuscript. The single hypothesis is the **GN(2)** postulate: for any putative counterexample in natural numbers to Fermat's equation

$$x^n + y^n = z^n \qquad (n > 2),$$

one must have the *coverage equality*

$$2^n \;=\; 2 \cdot n.$$

Together with the elementary growth fact $2^n > 2 \cdot n$ for all $n \geq 3$, this immediately yields a contradiction, hence Fermat's Last Theorem (FLT).

What is formalized in Coq.

- GN(2) is encoded directly over naturals:

$$\forall\, n > 2,\; x, y, z \in \mathbb{N}, \quad x^n + y^n = z^n \Rightarrow 2^n = 2 \cdot n.$$

- Using elementary growth lemmas, Coq proves that $2^n = 2 \cdot n$ forces $n \in \{1, 2\}$ (`pow_eq_linear_positive`); thus no solutions exist for $n > 2$ (`FLT_from_GN2`).

- A convenient real "wrapper" uses the predicate `pow 2 n = 2 * INR n` and bridge lemmas (`covers_two_nat`, `INR_two_mul_nat`) to recover $2^n = 2 \cdot n$ over $\mathbb{N}$ (`GN2_R_implies_GN2`). This yields `fermat_last_theorem_from_GN2_R`.

- Parity constraints stemming from the standard parametrization ($z := m^n + p^n$, $x := m^n - p^n$) are proved separately for completeness (`sum_diff_from_parameters_R/Z`, `parity_condition_Z`) and are *not* needed in the final step.

Motivation vs. proof. The discussion of $f(n) = (2n)^{1/n}$ motivates the *form* of the normalization (explicit base 2), but it is *not* used inside the core proof of the conditional implication GN(2) $\Rightarrow$ FLT.

Repository (code and PDFs): github.com/Gendalf71/FLT-Coq

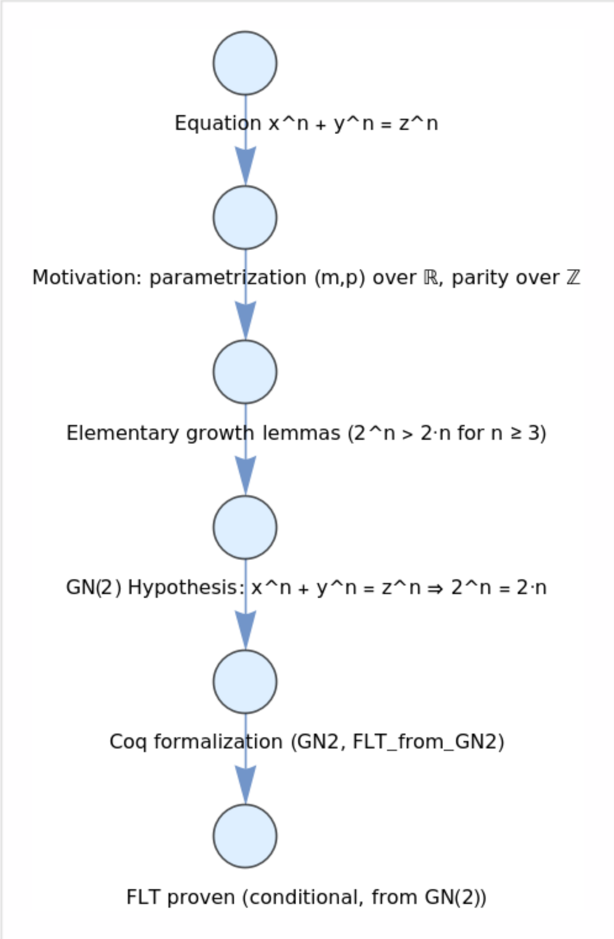

Figure 1: Formal pipeline: GN(2) $\Rightarrow$ FLT (Coq).

The package includes:

- `FLT.v`: Coq development (no `Admitted`); proofs compile.
- A reasoning flowchart (figure above).
- Explanatory PDFs (EN/RU), updated to the GN(2) reading.

Further reading:

- Reconstruction of Fermat's Proof (ResearchGate) — RU
- Formalization & discussion — EN