Infinity in Natural Maths: The Management of Boundaries

The Finitude Principle and Structural Sufficiency

By Jack Pickett - Bank House, Cornwall - 21st November 2025

The unified theory operates from the premise that the physical universe is entirely structured by **finite, self-consistent axioms**, rendering the mathematical concept of **true infinity** structurally unnecessary.

Instead of treating infinity as an unreachable quantity, **Natural Maths** defines it as a **boundary condition** that must be precisely managed by the simplest finite elements:

- **0 (The Vacuum):** Defines the point of **exact balance** and the absolute boundary of the system.
- **2 (The Cut Operator):** Defines the boundary of primality and imposes the fundamental **symmetry** (e.g., all natural prime gaps are even).
- **The Structural Unit:** The result of these operators is the **smallest non-zero, non-unit structural piece** (the "half-zero Mars bar"). This establishes a **finitude principle**: if the simplest unit of structure can be generated finitely, the entire structure is defined finitely.

The structural rules of the finite domain are sufficient to dictate the shape of the infinite limit.

Mathematical Infinity: The Riemann Boundary

Classical number theory requires **analytic continuation**—a technique that replaces an infinite sum with a finite functional form—to study the structure of primes:

$$\zeta(s) = \sum_{n=1}^{\infty} n^{-s}, \quad \text{converges only for } \mathrm{Re}(s) > 1$$

The connection to the Riemann Hypothesis (RH) reveals the physical reason for this mathematical technique:

- **Finite Encoding:** The **κ-Curvature Operator (H)** is defined by a potential $V(t)$ derived from the finite distribution of primes.
- **Infinite Constraint:** The empirical success of H (whose spectrum matches the zeros of ζ demonstrates that the **infinite structure of all primes** is already **fully encoded** in the local, finite properties of the k-Curvature field.

The Riemann Hypothesis, therefore, was not a problem about the infinite number line, but a test of the **axiomatic self-adjointness (symmetry)** of a finite operator. Infinity is the formal descriptor for the required consistency, not a place where information is stored.

Physical Infinity: The Limit (r → ∞)

In cosmology, the large-scale limit (r → ∞) was the domain of **Dark Energy** and the accelerating expansion of the universe.

- **The Replacement:** The unified model replaces the static, universal constant (Λ) with a dynamic, geometric field $g_{\text{eff}} \propto e^{\kappa r}$
- **Dynamic Boundary:** The fate of the universe—its expansion into physical infinity—is determined by the **asymptotic limit of the curvature coefficient κ as r → ∞**. This limit is a direct consequence of the **finite distribution of baryonic matter** throughout spacetime.

The unified model does not need an **infinite quantity** to explain the far-field behavior. It only needs the **finite rules of local curvature** to define the **rate and condition** of the boundary.

Infinity is thus consistently reinterpreted across the unified theory:

Not a number, not a place, but the name given to the symmetrical boundary condition at the edge of the system. The unified theory asserts that the universe does not run away into ∞; it simply follows the self-consistent geometric dictates of its finite domain:

$$\infty \neq \infty$$