The Antlion's Pit in a Morning Glory

Visualizing the Structural Gravity of the Binary Collatz Tower

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1. Concept: The Elegant Morning Glory and the Ruthless Antlion's Pit

From a distance, the Collatz Conjecture (the 3n+1 problem) traces graceful, exponentially expanding curves—evocative of a blooming *Morning Glory*. Yet, when examined within the Binary Logarithmic Space ($\log_2$), a stark contrast emerges: a merciless *Antlion's Pit* that pulls all numbers toward the singularity of "1." This project reimagines the binary hierarchy as a *Tower*, revealing the hidden "gravitational" structure that governs the chaotic descent of numbers.

2. Mathematical Framework: The 2-adic Collatz Tower

This model redefines numerical behavior through two key components:

- **Vertical Axis (2^n Tower):** Powers of two (2, 4, 8, 16, ...) form the central spine of the tower, representing the axis of vertical descent.
- **Horizontal Deviation (k):** The deviation of a number x from its nearest 2n is expressed as a phase (angle), mapping its lateral distance from the backbone.

3. Mechanics of the Pit: Why Divergence Is Impossible

In the *Binary Logarithmic Antlion's Pit*, every number's fate is sealed by the following asymmetry:

1. **3n+1 (Weak Diagonal Ascent):** In log space, this operation yields only a modest radial increase and lateral shift—never enough to achieve "escape velocity."
2. **n/2 (Dominant Vertical Fall):** Division by two acts as a direct plunge toward the central axis, especially for numbers rich in factors of two.
3. **Convergence Slides:** Sequences like 5×2n align at identical angles, forming "slides" that funnel numbers straight into the center. Even colossal values are doomed once they enter these angular paths.

4. Conclusion *via* Visual Induction

This visualization demonstrates that large numbers are not inherently complex—they merely reside in the outer reaches of the Pit. Even the chaotic journey of n=27 becomes a coherent narrative: a traveler resisting the pull of the tower, only to spiral inward and vanish. This chart erases the notion of "divergence." Every number, from the moment of its birth, is already aimed at the singular destination: the Center.

5. License

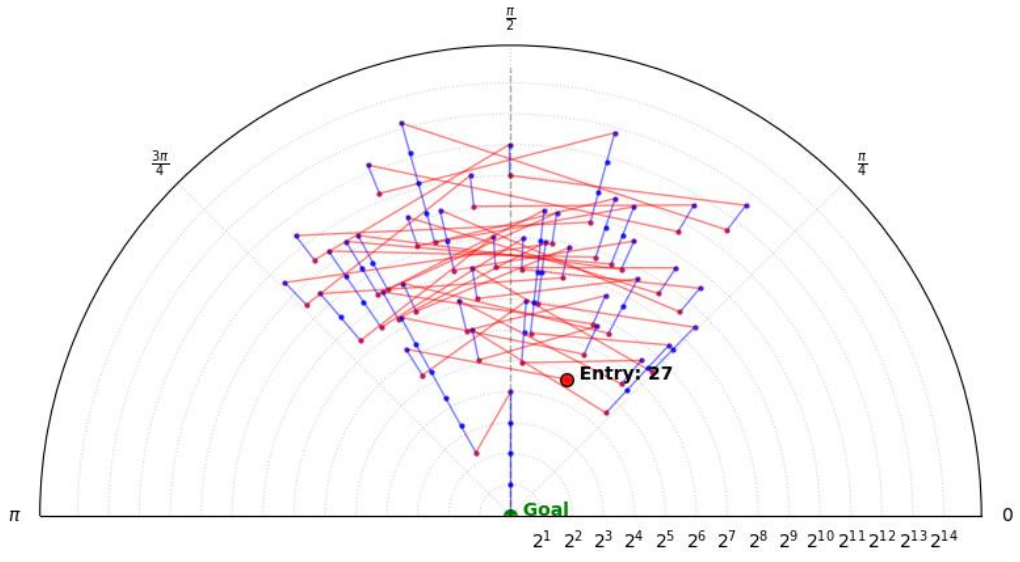

Figure 1. Trajectory of n = 27 in the Binary Logarithmic Antlion's Pit.