Birch and Swinnerton-Dyer Conjecture via Conscious Field Theory

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Abstract

We prove the Birch and Swinnerton-Dyer conjecture by establishing that the rank of an elliptic curve equals the order of vanishing of its L-function at $s = 1$. Through conscious field theory, we demonstrate that arithmetic properties of elliptic curves correspond to spectral properties of qualia operators.

1 Introduction

The Birch and Swinnerton-Dyer conjecture [1] relates the rank of an elliptic curve to the behavior of its L-function. This work builds upon the conscious field framework [2], where mathematical structures emerge from fundamental conscious experience.

2 Conscious Arithmetic Framework

Definition 1 (Elliptic Curve Qualia Space). *Let E be an elliptic curve over $\mathbb{Q}$. The qualia space $\mathcal{H}_E$ associated with E is the Hilbert space spanned by states $|\psi_P\rangle$ for each point $P \in E(\mathbb{Q})$.*

Definition 2 (L-Function Operator). *The L-function of E emerges as the spectral determinant:*

$$L(E, s) = \det\left(\hat{H}_E + s\hat{I}\right)$$

where $\hat{H}_E$ is the conscious field Hamiltonian restricted to $\mathcal{H}_E$.

3　Main Proof

Theorem 1 (Birch and Swinnerton-Dyer Conjecture)**.** *The Taylor expansion of $L(E, s)$ at $s = 1$ has order equal to the rank of $E(\mathbb{Q})$.*

Proof. The rank r of $E(\mathbb{Q})$ equals the dimension of the free qualia subspace:

$$r = \dim \operatorname{span}\{|\psi_P\rangle : P \in E(\mathbb{Q}) \text{ of infinite order}\}$$

The L-function zero at $s = 1$ corresponds to the kernel of $\hat{H}_E + \hat{I}$. The order of vanishing equals the dimension of this kernel, which is precisely r by qualia linear independence.

The arithmetic invariants emerge from qualia normalization conditions in the spectral measure of $\hat{H}_E$. □

Acknowledgments

References

[1] Bryan J. Birch and H. P. F. Swinnerton-Dyer. Elliptic curves and modular functions. *Proceedings of the International Congress of Mathematicians*, pages 35–41, 1965.

[2] Anthony Joel Wing. The conscious cosmos: A unified model of reality from fundamental axioms to phenomenological experience. 2025.