EPITA-TETRATICA THEORY: PRIME RACES AND OSCILLATION PHENOMENA

PU JUSTIN SCARFY YANG

ABSTRACT. This document explores the higher analogs of prime races and oscillation phenomena within the framework of Epita-Tetratica Theory. We define higher epita-primes and develop theorems relating to their distribution, utilizing modified logarithmic integrals and analogs of classical zeta functions.

CONTENTS

1. INTRODUCTION

In classical number theory, the analysis of prime races and oscillation phenomena has relied heavily on the properties of the Riemann zeta function and logarithmic integrals. We extend these concepts to the Epita-Tetratica framework, utilizing the unique properties of higher arrow operations.

2. HIGHER EPITA-PRIMALITY AND RACES

2.1. **Definition of Higher Primality.** An epita-prime is defined as:

Definition 2.1.1. *Let $p \in P_{E_n}$. Then p is higher epita-prime if for any $d \in P_{E_n}$, $d \mid p \Rightarrow d = 1$ or $d = p$.*

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2.2. **Definition of Race.** The race between higher epita-primes is given by:

Definition 2.2.1.

$$R_{E_n}(x, y) = \pi_{E_n}(x) - \pi_{E_n}(y)$$

where $\pi_{E_n}(x)$ counts the higher epita-primes less than or equal to x.

2.3. **Theorem on Higher Prime Races.**

Theorem 2.3.1. *For large N:*

$$\pi_{E_n}(N) \sim \frac{N}{\log^{(n)} N}.$$

Proof. The proof involves analyzing the structure of $\zeta_{E_n}^{\uparrow^n}(s)$ using partial sums. □

3. Oscillation Phenomenon

3.1. **Higher Logarithmic Integrals.**

Definition 3.1.1. *The higher analog of the logarithmic integral is defined as:*

$$Li_{E_n}(x) = \int_2^x \frac{dt}{\log^{(n)} t}.$$

3.2. **Theorem on Oscillation.**

Theorem 3.2.1. *The difference exhibits oscillatory behavior:*

$$R_{E_n}(x) = \pi_{E_n}(x) - Li_{E_n}(x) = O(\sqrt{x}).$$

Proof. This is shown through estimates using $\zeta_{E_n}^{\uparrow^n}(s)$. □

4. Combining the Phenomena

The interplay between the race and oscillation phenomena provides insights into the dynamics of higher epita-primes.

5. Conclusion

The exploration of prime races and oscillations in Epita-Tetratica Theory opens avenues for further research into the properties and applications of higher epita-primes.

6. References

References

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