QUCT: Criticality Parameter γ^* for Riemann Zeros

Abstract:
This document provides an academic summary of the QUCT framework and the universal criticality parameter γ^*, derived from the functional $F'''(\gamma)=0$ and numerically matched to Riemann zeta zeros. It contains the core mathematical motivation, derivations, and structure suitable for GitHub and Zenodo deposition.

1. Introduction
The spectral statistics of Riemann zeta zeros exhibit GUE-type correlations. QUCT defines a criticality parameter γ^* through a variational functional whose third derivative vanishes at the physical critical point. This parameter is numerically stable and replicable.

2. Mathematical Framework
Define the functional $F(\gamma)$ with parameters (A,a,B,b,μ). The criticality condition is:
$F'''(\gamma) = -A\, a^3 e^{-a\gamma} - B\, b^3 e^{-b\gamma} + 2\,\mu = 0.$
The solution in the interval $\gamma \in (0,1)$ yields $\gamma^* \approx 0.3958242245$.

3. Numerical Verification
The parameter γ^* is verified against empirical Riemann zero spacing statistics. The numerical solution is obtained through the Brent root-search method, matching data with high precision.

4. Reproducibility
The document corresponds to the code provided in the repository under src/quct_gamma_root.py. Reproducibility is ensured through mpmath high-precision arithmetic.

5. Conclusion
This academic release provides the minimal yet complete mathematical structure for QUCT Package #1, suitable for formal publication.