

The Birch and Swinnerton-Dyer conjecture: p -adic vs complex

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The celebrated conjecture Birch and Swinnerton-Dyer, one of Clay Millennium Problems, predicts the size of the group of rational points on an elliptic curve E (called the Mordell-Weil group of E) in terms of its Hasse-Weil L -function $L(E, s)$, which is a complex analytic object. In mid-80s Mazur, Tate and Teitelbaum formulated a p -adic version of this conjecture which seems more approachable via Iwasawa theoretic techniques. One then would like to compare the p -adic version to the original conjecture. This has been achieved in a recent work of mine so as to allow (using results of Kato, Skinner and Venerucci) to prove the following statement: The Mordell-Weil group of E has rank one if and only if the entire function $L(E, s)$ has a simple zero at $s = 1$.