

## **Abstract**

This exposition is the result of an year's study of the theory of elliptic curves. It has two parts. The first part of the report explains the group structure on points on elliptic curves and discusses two major results: Nagell-Lutz theorem and Mordell's Theorem. It turns out that over  $\mathbb{Q}$ , the group of points of an elliptic curve is a finitely generated Abelian group. A question of interest therefore is what the possible torsion and rank can be. A folklore conjecture asserts that there exist elliptic curves of arbitrary rank. The second part of this report explains a method due to Pomerance and Penney (1974) of creating elliptic curves of positive ranks. The report then discusses L-functions of elliptic curves and we explicitly compute L-function of certain elliptic curves. It is conjectured that the L-function and the group structure of an elliptic curve are intimately related. We end the report with a brief discussion of Birch and Swinnerton-Dyer conjecture.