

Counting Minimal Triples for a Generalized Markoff Equation

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Abstract-

If the generalized Markoff equation $a^2 + b^2 + c^2 = 3abc + m$ has a solution triple, then it has infinitely many solutions. For a positive integer $m \geq 1$, we show that all positive solution triples are generated by a finite set of triples that we call minimal triples. We exhibit a correspondence between the set of minimal triples with the first or second element equal to a , and the set of fundamental solutions of $m - a^2$ by the form $x^2 - 3axy + y^2$. This gives us a formula for the number of minimal triples in terms of fundamental solutions, and thus a way to calculate minimal triples using composition and reduction of binary quadratic forms, for which there are efficient algorithms. Additionally, using the above correspondence we also give a criterion for the existence of minimal triples of the form $(1, b, c)$, and present a formula for the number of such minimal triples.

Index Terms- Markoff triples; fundamental solutions; generalized Markoff equation; binary quadratic forms

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