

Solving Cubic Equations by ORIGAMI

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Abstract

We show an algebraic proof of the method for solving cubic equations by ORIGAMI (paper folding). Using ORIGAMI, we can solve the construction problems that are unsolvable in Euclidean geometry[2], such as angle trisection and doubling cubes.

In our formulation, first, we translate the geometrical conditions into polynomial relations among the coordinates of points[1]. Second, we compute a Gröbner basis of the ideal and solve the ideal membership problem. Consequently, cubic equations are solved as construction problems, and drawing a trisector of a given angle and the cubic root of 2 is clearly realized by ORIGAMI.

References

- [1] S.-C. Chou. *Mechanical Geometry Theorem Proving*. D.Reidel, Dordrecht, 1988.
- [2] T. Hull. A Note on “Impossible” Paper Folding. *American Mathematical Monthly*, 103(3):240–241, 1996.