

The four color theorem and Thompson's F

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The four color theorem is known as a theorem whose proof is very long. Bowlin and Brin tried to obtain a shorter proof of the theorem using binary trees, associahedron and an infinite group known as Thompson's F in 2013 [1]. The n -dimensional associahedron is a graph composed by binary trees having $n - 2$ leaves. They proved that, if for any pair of vertices D and R in the associahedron, there is a good path called a "valid path" from D to R , then the four color theorem follows. We consider the distance in the n -dimensional associahedron, and proved that for any pair of vertices D and R in the n -dimensional associahedron which have distance n , exists a valid path from D to R . In addition, we found a family $\{G_{n-2,k} \mid 0 \leq k \leq n - 2\}$ of vertices in the n -dimensional associahedron such that for every vertex D there is a valid path from D to $G_{n-2,k}$ for some k under a certain assumption. In this talk, we will introduce the relationship between the four color theorem and Thompson's F , and our results.

References

- [1] Garry Bowlin, Matthew G. Brin, Coloring planar graphs via colored paths in the associahedra. *Internat. J. Algebra Comput.* **23(6)** (2013) 1337–1418.