Rational representations of flowers

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Abstract

A flower is an embedding of the wheel graph in the Euclidean plane as a coin graph. In a given flower with \( n \) petals, the radii of the petals satisfy an algebraic equation, that we show is equivalent to a polynomial equation \( P_n = 0 \) where \( P_n \in \mathbb{Q}[x_1, \ldots, x_n] \) is irreducible. We will explore the properties of these polynomials and what they can tell us about the underlying graphs. In particular one might ask: when can we realize these flowers, using all rational radii? The case where the number of petals of the flower is \( n = 3 \) has a nice solution. In the case where \( n \geq 4 \) only partial answers are known.

Keywords: coin graph, wheel graph.