Solving Polynomial Equations

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Abstract

To solve a polynomial equation, we need to find the values of x that make the polynomial 0. That is, we want to find the roots of the polynomial. Then, if we want to give it a root canal, we'll know where to start.

If the polynomial factors into polynomials of degree 1, we can find the roots by factoring the polynomial. It feels good to stretch our factoring muscles once again.

Blowing an Apollonian Gasket

Joni Schneider

Abstract

Apollonius's problem states given three objects, each of which may be a point, line, or circle, draw a circle that is tangent to each. A special case of this problem is requiring the determination of a circle touching three mutually tangent circles. These mutually tangent circles are known as *kissing circles*. There are two solutions: a small circle surrounded by the three original circles, and a large circle surrounding the original three. Frederick Soddy gave the formula for finding the radius of the so-called inner and outer circles given the radii of the other three. The relationship is

$$k_1^2 + k_2^2 + k_3^2 + k_4^2 = \frac{1}{2}(k_1 + k_2 + k_3 + k_4)^2.$$

Denoting the curvatures of the circles by k_i. This formula is known as Descartes Circle Theorem. The configuration of the kissing circles are called *Descartes configurations*. This configuration can be made algebraically or using a special type of geometric transformation known as inversion. By continuously embedding Descartes configurations inside another Descartes configuration, we create an *Apollonian gasket*.