USING NEWTON FRACTALS FOR FINDING POLYNOMIAL ROOTS IN THE COMPLEX PLANE

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The problem of finding complex roots arises not only in algebra or number theory, but also in other fields. Various differential equations that describe physical processes: the behavior of nonlinear dynamical systems, turbulent fluid flows, diffusion, etc. - lead to the need to find the roots of polynomials. One of the popular methods of finding roots is Newton's method. Its essence is manifested in the consistent approach to the desired root in steps, and in the first step as the desired root is taken an arbitrary complex (real) number. The question of its choice and initial approximation is not obvious [1, 2].

What root we get or we don't get depends on what initial approximation we choose. Thus, the whole complex plane is divided into several infinite regions of chimeric form. The boundary of these areas has a lot of amazing properties [3].

As a result of the work, an application was created that draws Newton fractals with colored convergence regions for high-degree polynomials. The application allows to search for the roots of a polynomial using graphical images of Newton fractals. The accuracy of calculating the roots of a polynomial is very high and can be changed by the user. The application allows, by changing the parameters, to explore different parts of areas with different properties, to find problem areas: looping areas and border points. The application can serve as a demonstration of the elements of fractal geometry – the new science of mathematical and physical problems and phenomena. Due to which mathematical laws can be depicted graphically, which has aesthetic value. The program presents new and modern color geometry. The application has a calculator for performing algebraic operations with polynomials: addition-subtraction, multiplication, division with remainder, generating queries for searching the Internet, calculating a polynomial at a given point. A module for transferring results to an open Word document is also implemented. The application could be used by specialists in various fields, in classes for students and members of mathematical circles.

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