Theory of general conic sections - an unconventional approach

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The theory of general conics is among the most challenging parts of plane analytic geometry. In a standard way, the type of conic section specified in the general form can be determined using the matrix method, either using coordinate transformations or by calculating the eigenvalues and vectors of the matrix representing the specified conic section. Both methods are computationally demanding.

The presented article describes the method of determining the parameters of a general conic section entered in the Cartesian coordinate system based on the foundations of high school mathematics. During the calculation, knowledge of solving quadratic equations, finding the asymptote of a function and determining the extremes of functions of one variable are required. Using a simple procedure, the type of conic section is first determined, then its centre is found, and finally, its parameters are defined. Everything is done in the computer algebra program Maple environment, which allows a quick graphical representation of achieved results, easy export to various programming languages, or repeating the calculation with pencil and paper.

The described method and matrix method are taught in the subject of Linear Algebra and Analytical Geometry at the Polytechnic University in Opole.