PROPERTIES OF THE PARABOLA IN DIFFERENT COORDINATE SYSTEMS

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ABSTRACT

This article presents the properties of second-order lines in different coordinate systems, and the article can be used by young students studying analytical geometry in higher education institutions.

Keywords: Parabola, attempt, focus, distance, axis of symmetry.

INTRODUCTION

It is known that one of the ordered lines in the plane is a parabola, and a parabola is a set of points with equal distances from a fixed point called a focus to a point called a directrix. The focus of a parabola is its axis of symmetry and the interior of the parabola. The equation of the target of a parabola at an arbitrary point

$$yy_0 = p(x + x_0)$$

function to benefit from the derivative of the trial equation. (x_0, y_0) – attempt coordinates of the attempt. [1]

METHODS

In S.V. Bakhvalov’s "Collection of Problems from Analytical Geometry" and many other analytical geometry literatures, theorems and formulas related to ellipses are given, and some theorems need to be proved in the form of problems. Analytical geometry is taught as a basic subject not only in "Applied mathematics", but also in "Computer science and programming technologies", "Information systems and technologies", "Information security" and issues related to proofs for students of related fields. may cause some difficulties. We would like to make the study of analytical geometry a little easier by giving the properties of the parabola in different coordinate systems below. We hope that this information will be useful for students and professors in teaching the topic of ellipse and its canonical equations. [2],[3],[4]

RESULTS

Matter. Create the equation of the parabola $y^2 = 8x$ in the polar coordinate system.

Solving. Using the substitution $\begin{cases} x = \rho cos\varphi \\ y = \rho sin\varphi \end{cases}$, we switch from the Cartesian coordinate system to the polar coordinate system. As a result

$$(\rho sin\varphi)^2 = 8\rho cos\varphi$$

we will have From this

$$\rho = \frac{8cos\varphi}{sin^2\varphi}$$

we generate .

Matter. Construct the canonical equation of the parabola given by the equation $\rho = \frac{6}{1-cos\varphi}$

Solving. Using the substitution $\begin{cases} \rho = \sqrt{x^2+y^2} \\ \varphi = arctg\frac{x}{y} \end{cases}$ we get the following:

$$\sqrt{x^2+y^2} = \frac{6}{1 - cos\,(arctg\frac{x}{y})}$$

$$\sqrt{x^2+y^2} = \frac{6}{1 - \frac{y}{\sqrt{x^2+y^2}}}$$

$$1 = \frac{6}{\sqrt{x^2+y^2} - y}$$

$$\sqrt{x^2+y^2} - y = 6$$

$$\sqrt{x^2+y^2} = 6 + y$$

Squaring both sides of the equation, we get:

CONCLUSION

Today, the properties of the parabola are widely used, and the study of connections in different coordinate systems of the parabola is an urgent issue. Because a parabola is a second-order curve, its equation in the polar coordinate system is somewhat easier to apply. Because second-order lines like a parabola are twisted and parallelized in the Cartesian coordinate system, which allows it to be studied as a sum of several functions. This causes several problems. In the polar coordinate system, working with equations significantly increases the calculation work. [8], [9], [10]

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