

METHODOLOGY FOR GRAPHICALLY SOLVING SIMPLE INEQUALITIES INVOLVING INVERSE TRIGONOMETRIC FUNCTIONS

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Annotation: This thesis discusses the methodology for graphically solving simple inequalities involving inverse trigonometric functions. The thesis explains step-by-step the stages of solving these inequalities, namely, plotting the graph of the functions, determining the intersection points, and expressing the result in an intermediate form. The advantages of the graphical method include ease of visual perception, simplification of algebraic calculations, and help to consolidate concepts. It is also emphasized that when using the graphical method, the importance of correctly taking into account the areas of determination and drawing graphs accurately is emphasized. This approach is recommended as an effective method for developing students' analytical and visual thinking in the educational process.

Keywords: inverse trigonometric functions, inequalities, graphical method, arcsin, arccos, arctan, arccot, domain of definition, visual thinking.

INTRODUCTION

In modern mathematics education, the study of inverse trigonometric functions and their application in practical problems is of great importance. In particular, the use of graphical methods in the process of solving inequalities containing them not only strengthens mathematical concepts, but also develops visual thinking in students, forms the skills of solving problems with different approaches. Inequalities expressed using functions such as inverse trigonometric functions - arcsine, arccosine, arctangent and arccotangent - often seem complicated at the primary and secondary levels of education. Therefore, the graphical method is a convenient tool for interpreting them in a simple and intuitive way.

MAIN PART

Inverse trigonometric functions ($\arcsin x$, $\arccos x$, $\arctan x$, $\operatorname{arccot} x$) are the inverse expressions of simple trigonometric functions. Their main feature is that the values that their initial functions accept as arguments are specified, and the output produces angle values belonging to specific intervals. For example:

In the function $y = \arcsin x$, x is $[-1, 1]$ and y is from $-\pi/2$ to $+\pi/2$.

In the function $y = \arccos x$, x is $[-1, 1]$ and y is from 0 to π .

In the function $y = \arctan x$, x is an integer real number and y is from $-\pi/2$ to $+\pi/2$.

In the function $y = \operatorname{arccot} x$, x is an integer real number and y is from 0 to π .

Inequalities involving inverse trigonometric functions can be of the form:

$$\arcsin f(x) \leq g(x)$$

$$\arccos f(x) > k$$

and other similar expressions.

Solving such inequalities graphically involves the following steps:

1. Graph both functions. For example, let's take the inequality $\arcsin x \leq \pi/4$. In the first step, we reduce the straight lines $y = \arcsin x$ and $y = \pi/4$ to one coordinate system. The $\arcsin x$ function is an arc-shaped increasing curve, which is defined only from -1 to $+1$.
2. Determine the intersection points of the graphs. These points give an exact solution to the equality. When $\arcsin x = \pi/4$, then $x = \sin(\pi/4) = \sqrt{2}/2$.
3. Determine the desired area from the graph. Since $\arcsin x \leq \pi/4$, the interval whose graph is below the $\pi/4$ line is selected. That is, x is from -1 to $\sqrt{2}/2$.

4. Write the result in the form of an interval:

$x \in [-1; \sqrt{2}/2]$. This method can also be applied to inequalities involving other inverse trigonometric functions. For example:

$$\arctan(2x - 1) > \pi/6.$$

In this case, the graphs of $y = \arctan(2x - 1)$ and $y = \pi/6$ are also drawn, the intersection point is determined, and the x values above the graph are selected.

Advantages of the graphical method:

Allows students to visually understand the inequality.

Makes it easier to explain the increasing or decreasing properties of the inverse trigonometric function.

Reduces complex algebraic manipulations.

Important points:

Graphs must be drawn correctly.

The domain of the functions is taken into account.

If the argument is complex, separate calculations on intervals are required.

In addition to the graphical method, additional auxiliary approaches and analytical concepts are also important in solving inequalities involving inverse trigonometric functions. Because although the graphical method helps to understand the result more clearly, it requires the use of other methods to substantiate and verify it. In this regard, the following areas are distinguished:

Firstly, it is important to correctly understand the monotonicity and increase-decrease properties of inverse trigonometric functions. For example, the functions $\arcsin(x)$ and $\arctan(x)$ are monotonically increasing, and they always increase as the argument increases. This is an important tool in solving inequalities. If the graphs of two functions are given, it is possible to determine in which interval they are above or below each other using these characteristics of increase or decrease.

CONCLUSION AND DISCUSSION

The method of solving simple inequalities involving inverse trigonometric functions graphically is an effective method in the process of teaching mathematics. This method not only strengthens algebraic knowledge, but also helps to develop visual thinking and analytical skills in students. Therefore, it is recommended to widely use this approach in schools and higher educational institutions.

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