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PRACTICE OF FUNCTIONS IN LIFE

Annotation: The concept of numerical functions, which is one of the main branches of mathematics, is widely used in various fields. A function is a set of rules that define a variable result depending on the value of one or more arguments. The function plays an important role in mathematical modeling, in disciplines such as economics, physics, engineering, and computer science.

Keywords: Function, Function argument, Domain of definition, Domain of Values, Linear function, Architecture and Construction, Transport and Logistics, Quadratic function, Artificial Intelligence, Trigonometric functions, Navigation.

Аннотация. Понятие числовых функций, являющееся одним из основных разделов математики, широко используется в различных областях. Функция — это набор правил, определяющих переменный результат в зависимости от значения одного или нескольких аргументов. Функция играет важную роль в математическом моделировании, в таких дисциплинах, как экономика, физика, инженерия и информатика.

Ключевые слова:Функция, Аргумент функции, Область определения, Область значений, Линейная функция, Архитектура и строительство, Транспорт и логистика, Квадратичная функция, Искусственный интеллект, Тригонометрические функции, Навигация.

Introduction:A set of real numbers is given, and their non-empty subsets of are their elements, respectively. If each number in the set is assigned to one number from the set according to some rule or law, then the function is called given (defined) in the set and is symbolically denoted as. Here - argument or arbitrary variable, - function or arbitrary variable, - characteristic (law or rule); - the set is called the domain of the function, and the set is the set of its values (domain of variation). In the following, we denote the domain of the function by , and the set of values by .

A function can be given in general analytical, tabular, graphical and verbal methods. Often the relationship between and and variables is expressed using formulas. In this case, the value of the function corresponding to each value of the argument is found as a result of performing analytical operations on it - addition, subtraction, multiplication, division, exponentiation, root extraction, logarithmization, etc. operations. Usually such a method is called - analytical method of giving a function.

Any function is characterized by a domain and a range of values:

The domain is the set of values that the arguments can take.

The range of values is the set of results of the function.

For example, the domain of a function can be the set of integers, while the range of values consists only of positive or zero numbers.

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Mathematics: A function is one of the most fundamental concepts, widely used in algebra, geometry, analysis, and probability theory. For example, in mathematical analysis, concepts such as limit, derivative, and integral are based on functions.

Physics: A function is used to express the laws of physics. For example, there are functions that describe the dependence of temperature on time, the relationship between velocity and time, or the dependence of force and motion on time.

Economics: Economic models are often in the form of functions, such as supply and demand functions, production functions, and consumer utility functions. These functions help in understanding and forecasting economic changes.

Biology: Functions are used to model the biological processes of organisms. For example, the relationship between energy and resources produced during photosynthesis in plants, or the balance between organs in the human body.

Computer science: Functions are used in computer science to represent parts of an algorithm or program that perform certain operations. For example, in software, there are functions that accept parameters and return a certain result.

Chemistry: Functions are also used to represent chemical reactions. Chemical kinetics, for example, includes functions that show the relationship between the rate of a reaction and concentrations.

Linear function

A linear function is a function that is expressed in the general form:

$y = ax + b$

Where:

- a is the coefficient of the function (gradient or slope),

- b is the starting point (point of intersection with the ordinate axis),

- x is the independent variable,

- y is the dependent variable.

It is depicted as a straight line. The graph is a straight line in the coordinate system.

The slope α determines the slope of the line:

- If $\alpha > 0$, the function is increasing (rising from left to right).

- If $\alpha < 0$, the function is decreasing (falling from left to right).

- If $\alpha = 0$, the function is a horizontal line and has a constant value.

β indicates the point of intersection with the ordinate axis. Then, when $x = 0$, $y = \beta$.

Only one linear function passes through any two points.

A function is always differentiable because its graph is a straight line, continuous and without sharp turns.

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1. y = 2x + 3 is a linear function. Its graph intersects the ordinate axis at point 3 and increases with a slope of 2 units.

2. y = -x + 5 is a decreasing linear function, its graph intersects the ordinate axis at point (0,5).

Linear functions are common in everyday life. Here are some examples of their practical applications:

Financial calculations Salary calculation: If wages are paid hourly, the salary (y) is expressed as hourly rate (a) × hours worked (x) + bonus (b). Loan and interest calculations: The monthly payment of a loan or the calculation of interest is often expressed as linear equations.

Transport and logistics Distance and time calculation: Based on the formula Distance (y) = speed (a) × time (x). For example, if a car is traveling at a speed of 60 km/h, it will cover a distance of y = 60 × 2 = 120 km in 2 hours. Fuel consumption: The fuel consumption of a car is estimated using a linear function, for example, fuel consumption (y) = liters/100 km (a) × distance traveled (x).

Economics and Business Price and Demand Relationship: When the price of a product increases, the demand for it can decrease or increase. This process is often described by a linear model. Revenue and Costs: In a manufacturing business, revenue (y) = product price (a) × quantity sold (x) – fixed costs (b).

Natural Sciences and Engineering Temperature Change: For example, in the processes of melting ice or evaporating water, temperature can change linearly with time. Laws of Electricity: In Ohm's Law, voltage (V) = resistance (R) × current (I) has a linear relationship.

Programming and Artificial Intelligence Machine learning uses linear regression to develop forecasting, trend detection, and decision-making systems. Data Analysis: Using linear functions, it is possible to predict changes and perform statistical analyses.

Architecture and Construction Calculating Material Lengths: In construction, linear functions are used to predict the length of a wall, the amount of concrete poured, or the need for other materials. Building Height and Shadow: The relationship between the angle of incidence of sunlight and the height of a building can be calculated using a linear model. These examples illustrate the importance of linear functions in our lives. They play an important role in mathematical modeling, problem analysis, and forecasting.

Quadratic Function

A quadratic function is written in the form of a quadratic function:

$y = ax^2 + bx + c$

The graph of such a function is in the form of a parabola. The quadratic function plays an important role in mathematics and its field of application is very wide. Here are some of the main applications of the quadratic function in real life:

In Physics, Equations of Motion: The formula for the height of a freely falling object is written based on a quadratic function. Projective Motion: In sports, it is used to calculate the trajectory of throwing a ball or a rocket. Optics and mechanics: The refraction of light in mirrors and lenses, and the focal length are expressed by quadratic equations.

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In engineering and construction, Bridge and building design: Arch bridges are modeled by quadratic functions. Material strength calculation: Quadratic functions are used to predict the deflection of concrete or metal structures. Road design: Important in the design of curved roads, tunnels, and overpasses.

In economics and business, Profit and loss analysis: The relationship between output and profit is often in the form of a quadratic function. The extremum point (bottom or peak) of the quadratic function is considered to maximize profit. Price and demand analysis: Some economic models represent the quadratic relationship between demand and price

In computer graphics and animation, 3D modeling: Quadratic functions are used to model 3D objects, such as when creating bezier curves or surfaces. In game physics: Quadratic functions are used to simulate the motion of objects and the effects of gravity in games.

In biology and medicine Population growth: In some cases, population growth is modeled using quadratic functions. Radiation doses: Used to calculate the level of X-ray or other radiation.

Trigonometric functions are widely used not only in mathematics classes, but also in fields such as physics, engineering, medicine, astronomy, economics, and computer graphics. These functions make it easier to model and calculate real-world phenomena.
y = sin(x), y = cos(x), y = tg(x)
They have a periodic nature and are used in physics to describe waves, oscillating motion, and electrical current changes.
Exponential and logarithmic functions
Exponential function:
y = e^x
Logarithmic function:
y =log_af_0x
These functions are widely used in finance, biology, and computer science.
Basic properties of a function
Functions can have the following important properties:
Increasing and decreasing - A function can increase or decrease in value as its argument increases.
Continuity – Some functions have a definite value at every point (continuous), while others may be continuous.
Differentiability – If a function has a derivative, its rate of change can be measured.
Graphing and Analysis of Functions
The graph of a function is important in mathematics. Using a graph, you can determine the properties of a function:
Linear functions – have the shape of a straight line.
Quadratic functions – have the shape of a parabola.
Trigonometric functions – produce a sinusoidal wave.
Each graph helps to understand the variation, extremum points, and limit behavior of a function.
Practical Applications
Numerical functions are widely used in the following fields:
1. Physics – Equations of motion, waves, energy calculations.
2. Economics – Supply and demand models, interest calculations.
3. Engineering – Electrical networks, signal processing.
4. Computer Science – Artificial Intelligence, Data Analysis.

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5. Statistics – Forecasting, Regression Analysis.

Numerical functions $x=[x]+\{x\}$,(where $[x]$ is the integer part of the number, and $\{x\}$ is the fractional part of the number). The equations $0\leq\{x\}<1$, and $x-1<[x]\leq x$ are valid.

Example: $[12.3]=12$ and $\{12.3\}=0.3$ are valid, $12.3=[12.3]+\{12.3\}=12+0.3$ is valid.

If the number is negative, then $[-12.3]=-13$ and $\{-12.3\}=0.7$, $-12.3=[-12.3]+\{-12.3\}=-13+0.7$

Numerical functions are one of the main branches of mathematics, and their theoretical and practical significance is very great. These functions are widely used in physics, economics, computer science, engineering and other fields. Their calculation methods are carried out using analytical, numerical and computer modeling methods. In the future, a deeper study of numerical functions and their application to real life will help develop new innovations.

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