

# Expression of Mathematical Functions in the Python Programming Language

**Alimova Rayhon  
Abdugaforovna**

Student of the Faculty of Information Technologies of Termiz State University

## ABSTRACT

In this article, we will look at mathematical functions and how they are represented in the python programming language and environment. We will refer to the library of mathematical functions included in the Python programming language, and we will compile programs of several mathematical functions and show the results.

## Keywords:

Standard functions, math, expression, import, python, mathematical functions, maximum, minimum, sum.

Mathematical functions included in the Python programming language are called standard functions. Standard functions are used to represent functions in expressions in the Python programming language. To express functions in the Python programming language, their arguments must be enclosed in parentheses. To use mathematical functions in the Python programming language, it is necessary to refer to the library of mathematical functions included in the Python language. The Python programming language has modules and functions for performing ready-made math operations, the name of this module is math. This module helps us to perform numerical operations. An expression is a combination of numbers, letters

with arithmetic operations and parentheses. The execution of operations contained in expressions in the Python programming language corresponds to the order of execution of operations in mathematics. The unknowns in the expressions should be written only in the Latin alphabet. If the expression contains two or more terms in the numerator or denominator of a fractional number, they must be enclosed in parentheses in Python. The process of execution of mathematical functions is performed in the same way in Python programming language as it is in mathematics.

Several commonly used mathematical functions in the Python programming language are written as follows:

<code>sqrt(x)</code>	square root of x
<code>log(x), log2(x), log10(x)</code>	$\ln x, \log_2 x, \log_{10} x$
<code>sin(x), cos(x), tan(x)</code>	$\sin x, \cos x, \tan x$ are trigonometric functions
<code>factorial(x)</code>	x factorial calculation function
<code>pi</code>	$\pi$ the number $\pi=3.1415...$
<code>e</code>	Exponential function $e=2.71...$
<code>pow(x, y)</code>	calculates the y - level of x

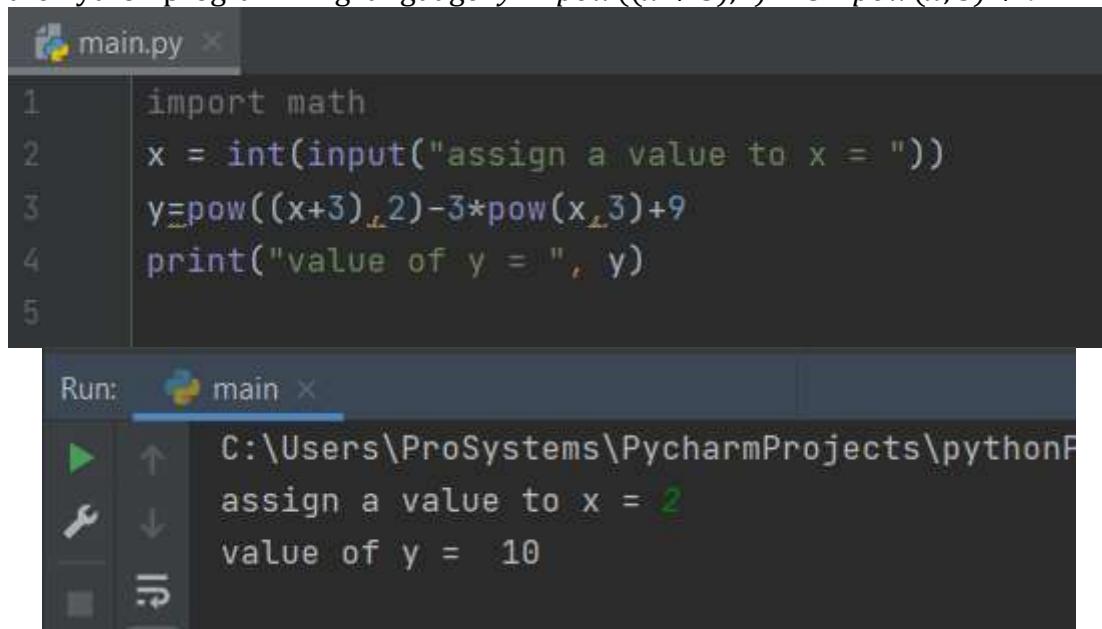
In addition, in the standard library of the Python programming language, several functions such as maximum, minimum, and sum have been defined on sequences. In other programming languages, these functions are built using separate algorithms, while in Python programming language, these functions are stored ready. Therefore, it is convenient to use them directly in the software environment.

max(a, b, ...)	Finding the largest of numbers or tuples. max(2, -8)=2
min(a, b, ...)	Finding the smallest of numbers or tuples. min(2, -8)=-8
sorted(a, b, ...)	Sort numbers. sorted(3,12,-9)=(-9,3,12)
sum(a, b, ...)	Finding the sum of numbers or tuples. sum(2, -8)=-6

Let's see how to express several mathematical expressions in the python programming language:

1) Mathematical expression:  $y = (x + 3)^2 - 3x^3 + 9$

Writing in the Python programming language:  $y = \text{pow}((x + 3), 2) - 3 * \text{pow}(x, 3) + 9$



The screenshot shows the PyCharm IDE. The top window is titled 'main.py' and contains the following Python code:

```

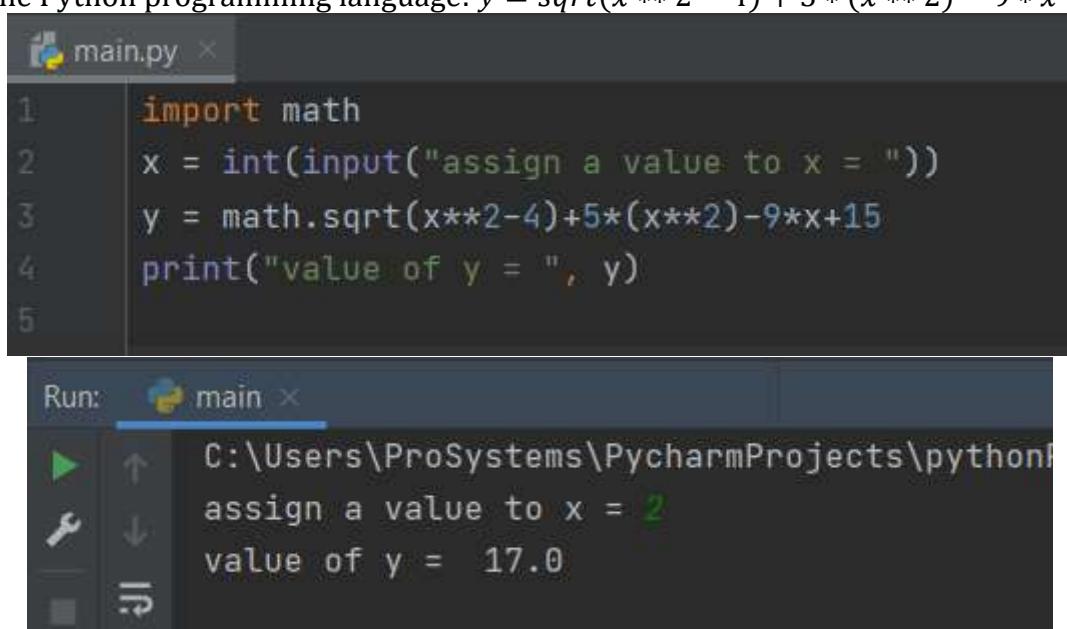
1 import math
2 x = int(input("assign a value to x = "))
3 y = pow((x+3), 2) - 3 * pow(x, 3) + 9
4 print("value of y = ", y)
5

```

The bottom window is titled 'Run: main' and shows the output of the program. It prompts the user to 'assign a value to x = 2', and then prints 'value of y = 10'.

2) Mathematical expression:  $y = \sqrt{x^2 - 4} + 5x^2 - 9x + 15$

Writing in the Python programming language:  $y = \text{sqrt}(x ** 2 - 4) + 5 * (x ** 2) - 9 * x + 15$



The screenshot shows the PyCharm IDE. The top window is titled 'main.py' and contains the following Python code:

```

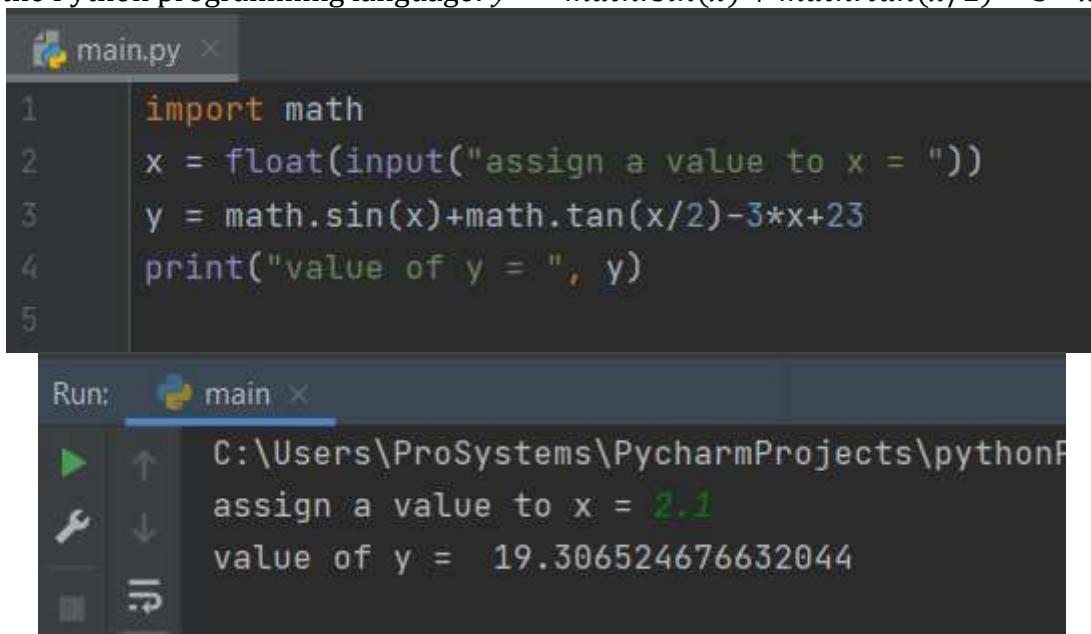
1 import math
2 x = int(input("assign a value to x = "))
3 y = math.sqrt(x**2-4)+5*(x**2)-9*x+15
4 print("value of y = ", y)
5

```

The bottom window is titled 'Run: main' and shows the output of the program. It prompts the user to 'assign a value to x = 2', and then prints 'value of y = 17.0'.

3) Mathematical expression:  $y = \sin x + \tan \frac{x}{2} - 3x + 23$

Writing in the Python programming language:  $y = \mathit{math}.\sin(x) + \mathit{math}.\tan(x/2) - 3 * x + 23$



The screenshot shows the PyCharm IDE. The top window is titled 'main.py' and contains the following Python code:

```

1 import math
2 x = float(input("assign a value to x = "))
3 y = math.sin(x)+math.tan(x/2)-3*x+23
4 print("value of y = ", y)
5

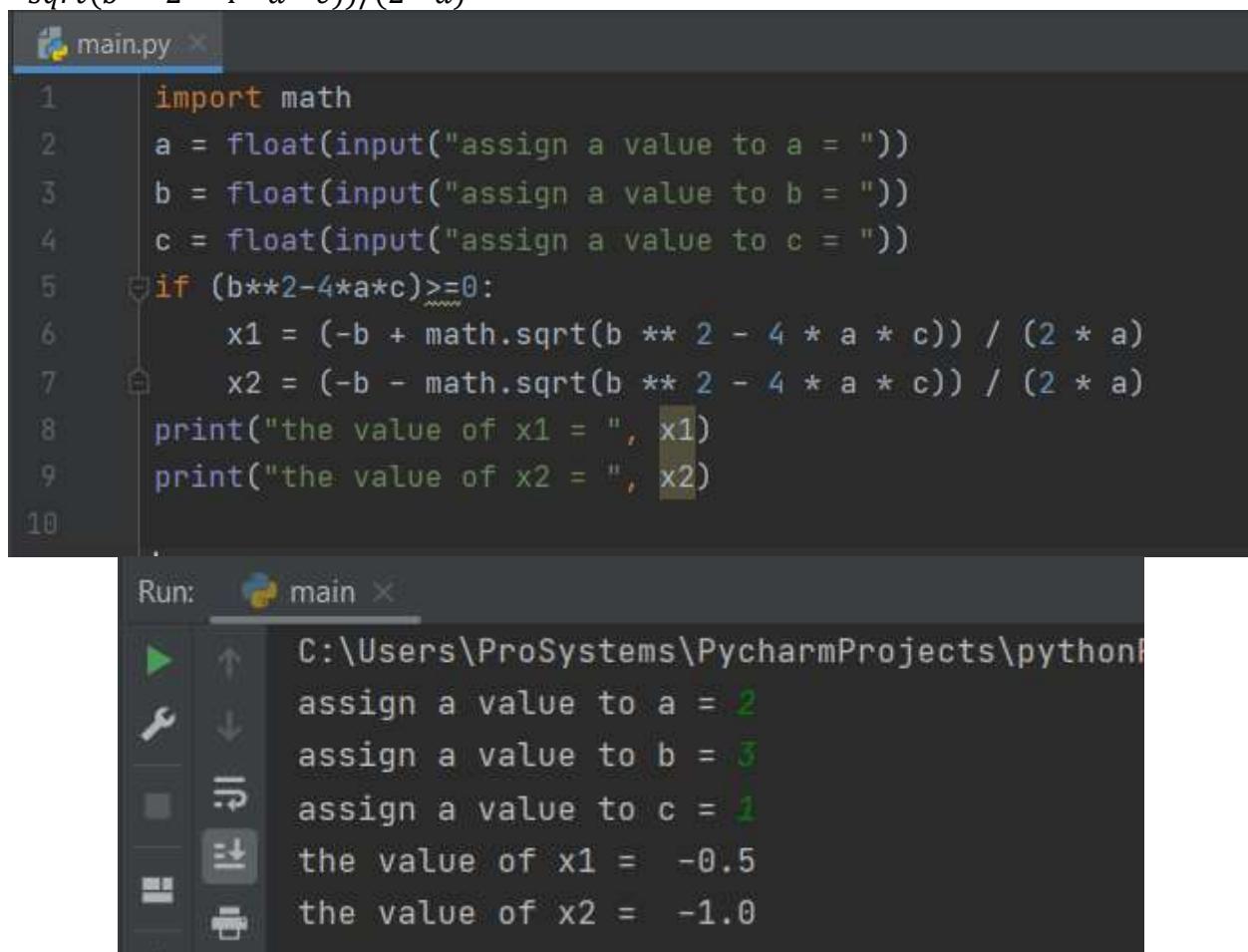
```

The bottom window is titled 'Run' and shows the output of the program. It displays the command to assign a value to x, the value assigned (2.1), and the resulting value of y (19.306524676632044).

4) Mathematical expression:  $y = ax^2 + bx + c$  kvadrat tenglamaning ildizlari

$$x_1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a}, x_2 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

Writing in the Python programming language:  $x1 = (-b + \sqrt{b ** 2 - 4 * a * c}) / (2 * a); x2 = (-b - \sqrt{b ** 2 - 4 * a * c}) / (2 * a)$



The screenshot shows the PyCharm IDE. The top window is titled 'main.py' and contains the following Python code:

```

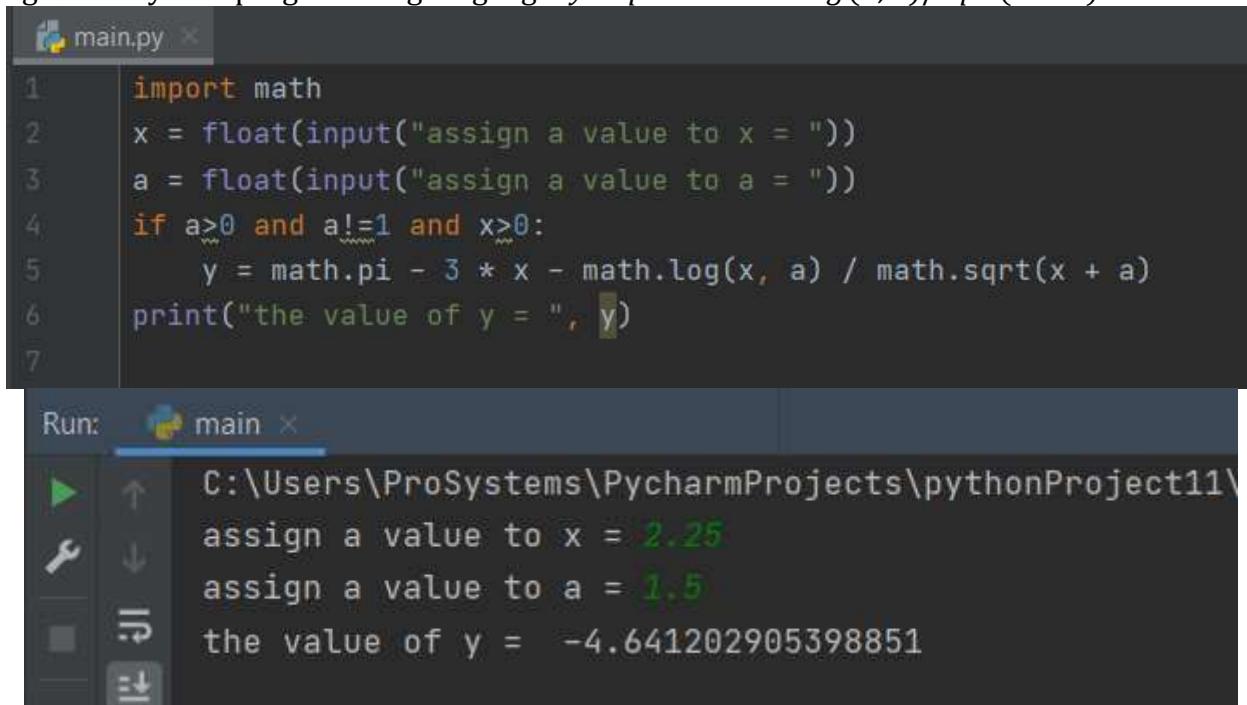
1 import math
2 a = float(input("assign a value to a = "))
3 b = float(input("assign a value to b = "))
4 c = float(input("assign a value to c = "))
5 if (b**2-4*a*c)>=0:
6     x1 = (-b + math.sqrt(b ** 2 - 4 * a * c)) / (2 * a)
7     x2 = (-b - math.sqrt(b ** 2 - 4 * a * c)) / (2 * a)
8     print("the value of x1 = ", x1)
9     print("the value of x2 = ", x2)
10

```

The bottom window is titled 'Run' and shows the output of the program. It prompts for values of a, b, and c, and then prints the values of x1 and x2. For example, if a=2, b=3, c=1, it prints x1 = -0.5 and x2 = -1.0.

5) Mathematical expression:  $y = \pi - 3x - \frac{\log_a x}{\sqrt{x+a}}$

Writing in the Python programming language:  $y = \pi - 3 * x - \log(x, a) / \sqrt{x + a}$



```

1 import math
2 x = float(input("assign a value to x = "))
3 a = float(input("assign a value to a = "))
4 if a>0 and a!=1 and x>0:
5     y = math.pi - 3 * x - math.log(x, a) / math.sqrt(x + a)
6     print("the value of y = ", y)
7

```

Run: main

C:\Users\ProSystems\PycharmProjects\pythonProject11\

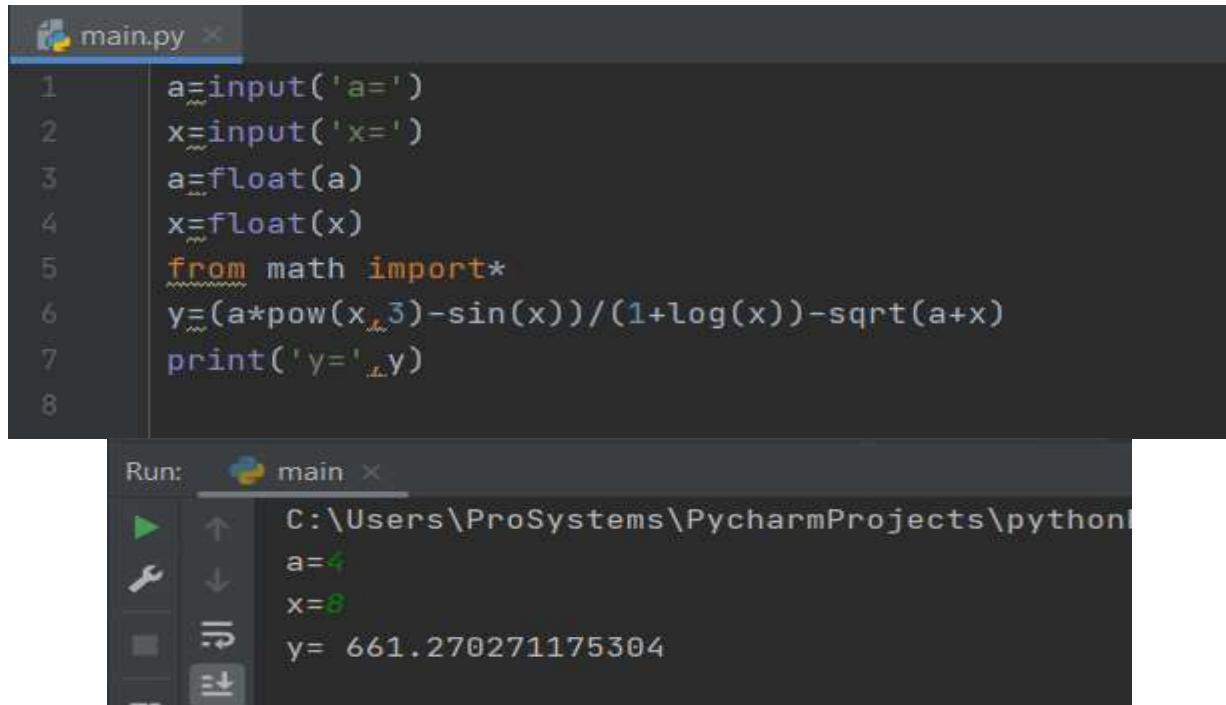
assign a value to x = 2.25

assign a value to a = 1.5

the value of y = -4.641202905398851

6) Mathematical expression:  $y = \frac{ax^3 - \sin x}{1 + \ln x} - \sqrt{a + x}$

Writing in the Python programming language:  $y = (a * \text{pow}(x, 3) - \sin(x)) / (1 + \log(x)) - \sqrt{a + x}$



```

1 a=input('a=')
2 x=input('x=')
3 a=float(a)
4 x=float(x)
5 from math import*
6 y=(a*pow(x,3)-sin(x))/(1+log(x))-sqrt(a+x)
7 print('y=' ,y)
8

```

Run: main

C:\Users\ProSystems\PycharmProjects\pythonProject11\

a=4

x=8

y= 661.270271175304

**Conclusion:** The Python programming language has several functions defined in the standard library. In other programming languages, these functions are built using separate algorithms, while in Python programming language, these functions are stored ready. To write mathematical functions

in programming code, it is necessary to know the contents of the library and how to use it. That's why in this article we looked at mathematical functions and how they are expressed in the python programming language and environment, we made a reference to the library of mathematical functions contained in

the python language and created a program of several mathematical functions and got the result. I think this is important for those who are interested in mathematics and programming.

## References

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