

PYTHON DASTURLASH TILINING SYMPY VA SCIPY KUTUBXONALARIDAN FOYDALANGAN HOLDA INTEGRALGA DOIR MASALALARNI HAL QILISH

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Annotatsiya: *Python dasturlash tili joriy yilda eng zamonaviy, eng sodda, dasturchilar tomonidan eng ko'p qo'llanilayotgan til sifatida e'tirof etildi. Amaliy jihatdan olib qaraydigan bo'lsak, Pythonda masalalar to'plamiga oid o'zbekcha kitoblarimiz sanoqli. Ularda axborot juda kam bo'lib, sayoz yozilgan. Ushbu maqolada SymPy va SciPy kutubxonalari va ulardan foydalanib integralga doir masalalarni hal qilish haqida fikr yuritilgan.*

Kalit so'zlar: *Python, PyCHarm, SymPy, SciPy, integral.*

Hozirgi kunda ko'pchilik mutaxassislar turli fanlar bo'yicha vazifalarni mukammal bajarishda Python dasturlash tilidan foydalanishni qulay deb hisoblaydilar va shu sababdan ko'plab mutaxassislik sohaslarida Python dan foydalanishni afzal ko'radilar. Xususan ushbu dasturlash tili moliya, marketing, sug'urta va amaliy fanlar sohaslari orasida ham ommalashib bormoqda. Bizga ayonki matematika, fizika, kimyo va boshqa fanlardagi ma'lum masalalarni hisoblashda murakkab ko'rinishdagi integrallarga duch kelamiz va bu integrallarni hisoblashda Python dasturlash tili o'zining ko'p qirraliligi, foydalanish qulayligi va kutubxonalarining keng assortimenti, raqamli hisoblash, ma'lumotlarni tahlil qilish qobiliyati bilan ajralib turadi. Bundan tashqari foydalanuvchi Python dasturlash tilining IDE si bo'lgan PyCharm dasturlash tilidan foydalanish uchun dasturiy ta'minot ishlab chiqaruvchisi bo'lishi shart emas. Ushbu masalalardan ko'rinadiki ta'limda zamon talabi asosida darslar sifatini yaratish va zamonaviy texnologiyalarni joriy etish masalasi juda dolzarb. Shularni inobatga olgan holda ushbu maqolamizda o'quv jarayonlarida talabalarga qiyinchilik tug'diradigan ba'zi integralga oid misollarining natijalarini Python dasturlash tilining IDEsi PyCHarmdan foydalanib yekshirishni ko'rib chiqamiz.

Dastlab PyCHarmni (<https://www.jetbrains.com>) saytidan yuklab olinadi. So'ngra ushbu ketma-ketlikda SymPy va SciPy kutubxonalari o'rnatiladi. Bu kutubxonalarni o'rnatishni bir necha usullari bor bo'lib ulardan biri SymPy va SciPy kutubxonalarini

Terminalga o‘tib ,terminal oynasida **pip install sympy** buyrug‘ini kiritish orqali Python kutubxona servirdan SymPy kutubxonasini yuklab o‘rnatishdir.

```
... Установите последнюю версию PowerShell для новых функций: https://aka.ms/PSWindows
(venv) PS C:\Users\HP\PycharmProjects\pythonProject> pip install sympy
Requirement already satisfied: sympy in c:\users\hp\pycharmprojects\pythonproject\venv\lib\site-packages (1.12)
Requirement already satisfied: mpmath>=0.19 in c:\users\hp\pycharmprojects\pythonproject\venv\lib\site-packages (from sympy) (1.3.0)

[notice] A new release of pip is available: 23.2.1 -> 24.0
[notice] To update, run: python.exe -m pip install --upgrade pip
(venv) PS C:\Users\HP\PycharmProjects\pythonProject>
```

SciPy kutubxonasi ham SymPy kutubxonasini o‘rnatish bilan deyarli bir xil **pip install scipy** buyrug‘i bilan yuklab olinadi.

```
[notice] A new release of pip is available: 23.2.1 -> 24.0
[notice] To update, run: python.exe -m pip install --upgrade pip
(venv) PS C:\Users\HP\PycharmProjects\pythonProject> pip install scipy
Collecting scipy
  Obtaining dependency information for scipy from https://files.pythonhosted.org/packages/fd/a7/5f829b100d208c85163aeba93faf01d088d944fc91585338751d812f1e4/scipy-1.12.0-cp310-cp310-win_amd64.whl.metadata
  Downloading scipy-1.12.0-cp310-cp310-win_amd64.whl.metadata (60 kB)
    ----- 60.4/60.4 kB 119.0 kB/s eta 0:00:00
Collecting numpy<1.29.0,>=1.22.4 (from scipy)
  Obtaining dependency information for numpy<1.29.0,>=1.22.4 from https://files.pythonhosted.org/packages/19/77/538f202862b9183f54108557bfda67e17603fc560c384559e769321c9d92/numpy-1.26.4-cp310-cp310-win_amd64.whl.metadata
  Downloading numpy-1.26.4-cp310-cp310-win_amd64.whl.metadata (61 kB)
    ----- 61.0/61.0 kB 92.9 kB/s eta 0:00:00
Downloading scipy-1.12.0-cp310-cp310-win_amd64.whl (46.2 MB)
    ----- 1.6/46.2 MB 56.1 kB/s eta 0:13:16
```

SymPy va SciPy kutubxonalari integrallarni hisoblashda ko‘plab imkoniyatlarga ega bo‘lib quyida bu imkoniyatlarning ba‘zilarini qo‘llash orqali murakkab ko‘rinishdagi integrallarni hisoblash jarayoni bilan tanishib chiqamiz.

Pycharmda SymPy kutubxonasidan foydalanish.

SymPyda `sympy.integrate(f)` funksiyasi orqali aniq `sympy.integrate(f,(x, a, b))` dan foydalanib esa noaniq integrallar hisoblanadi.

1-misol. Aniqmas integralni hisoblang .

$$\int \frac{1}{1+x^4} dx$$

Yechilishi: $\frac{1}{1+x^4} = \frac{Ax+B}{x^2-\sqrt{2}x+1} + \frac{Cx+D}{x^2+\sqrt{2}x+1}$ bu tenglamadan

$$(A+C)(x^2+\sqrt{2}x+1) + (Cx+D)(x^2+\sqrt{2}x+1) = 1$$

tenglikni hosil qilamiz va bu tenglikni soddalashtirish natijasida

$$(A+C)x^3 + (A\sqrt{2}+B-C\sqrt{2}+D)x^2 + (A+B\sqrt{2}+C-D\sqrt{2})x + (B+D) = 1$$

ayniyat kelib chiqadi. Ayniyatning mos koeffitsientlarini tenglab

$$A = -\frac{1}{2\sqrt{2}}, \quad B = \frac{1}{2}, \quad C = \frac{1}{2\sqrt{2}}, \quad D = \frac{1}{2}$$

ga ega bo‘lamiz.

$$\int \frac{dx}{1+x^4} = \int \left(\frac{Ax+B}{x^2-\sqrt{2}x+1} + \frac{Cx+D}{x^2+\sqrt{2}x+1} \right) =$$

$$\frac{1}{4\sqrt{2}} \left(-\int \frac{2x-\sqrt{2}}{x^2-\sqrt{2}x+1} dx + \int \frac{\sqrt{2}dx}{x^2-\sqrt{2}x+1} + \int \frac{2x+\sqrt{2}}{x^2+\sqrt{2}x+1} dx + \int \frac{\sqrt{2}dx}{x^2+\sqrt{2}x+1} \right)$$

$$= \frac{1}{4\sqrt{2}} \log \left| \frac{x^2+\sqrt{2}x+1}{x^2-\sqrt{2}x+1} \right| + \frac{1}{2\sqrt{2}} \left(\arctg(\sqrt{2}x+1) + \arctg(\sqrt{2}x-1) \right) + c$$

Javob: $\frac{1}{4\sqrt{2}} \log \left| \frac{x^2+\sqrt{2}x+1}{x^2-\sqrt{2}x+1} \right| + \frac{1}{2\sqrt{2}} \left(\arctg(\sqrt{2}x+1) + \arctg(\sqrt{2}x-1) \right) + c$

Natijamizni Pycharm'dagi natija bilan solishtirib ko'ramiz.

SciPy kutubxonasidan foydalanish.

SciPy - bu ilmiy va matematik hisob-kitoblar uchun ishlatiladigan Python tilidagi bepul va ochiq manbali kutubxona. Scipy kutubxonasini umumiy maqsadi, amaliy matematik ilmiy tadqiqot, axborot tahlili, statistika, fizika va boshqa ilmiy sohalaridagi muammolarni va topshiriqlarni hal qilish uchun sinflik funksiyalarni taqdim etishdir.

```
#SymPy:Matematik kutubxonasi hisoblashlar uchun turli funksiyalarni taqdim etadi.
#Symbol:o'zgaruvchining ramziy ko'rinishini ifodalaydi.
#integrate:Funksiyaning noaniq integralini hisoblaydi.
from sympy import Symbol,integrate
x=Symbol('x')
print(integrate (1/(1+x**4),x))
```

SciPy kutubxonasidan foydalangan holda bir va ikki o'lchovli integralga doir masalalarni ko'rib chiqamiz.

```
1 from sympy import Symbol,integrate
2 x=Symbol('x')
3 print(integrate ( *args: 1/(1+x**4),x))
4
5
main
C:\Users\HP\PYcharmProjects\pythonProject\venv\Scripts\python.exe C:\Users\HP\PYcharmProjects\pythonProject\main.py
-sqrt(2)*log(x**2 - sqrt(2)*x + 1)/8 + sqrt(2)*log(x**2 + sqrt(2)*x + 1)/8 + sqrt(2)*atan(sqrt(2)*x - 1)/4 + sqrt(2)*atan(sqrt(2)*x + 1)/4
```

3-misol. $\int_{-1}^2 (ax+b)dx$ ni hisoblang.

Yechilishi:

$$\int_{-1}^2 (ax+b)dx = \frac{ax^2}{2} + bx \Big|_{-1}^2 = \frac{a \cdot (2)^2}{2} + 2 \cdot b - \left(\frac{a \cdot (-1)^2}{2} + (-1) \cdot b \right) = \frac{3a}{2} + 3b$$

Javob: $\frac{3a}{2} + 3b$

```
#Scipy.integrate paketi bir nechta integral turlarini hisoblashda foydalaniladi
#Scipy.integrate funksiyasini import qilamiz
from scipy.integrate import *
#keyingi qadamda o'zgaruvchilarni kiritamiz :
def integrate(x,a,b):
return a*x+b
a=int(input('a='))
b=int(input('b='))
#quad(func,a,b):integralni hisoblashda ishlatiladi
#(func)-Berilgan funksiya
#(a dan b gacha)-integral chegaralari
#args=(a,b)-funksiyaga uzatiladigan qo'shimcha argumentlar a va b ning
qiymatlarini uzatadi.
#integral chegarasini quyi -1 va yuqori 2 kiritamiz.
I=quad(integrate,-1,2,args=(a,b))
print(I)
```

```
1 from scipy.integrate import *
2 def integrate(x,a,b):
3     return a*x+b
4 a=int(input('a='))
5 b=int(input('b='))
6 I=quad(integrate,-1,2,args=(a,b))
7 print (I)
```

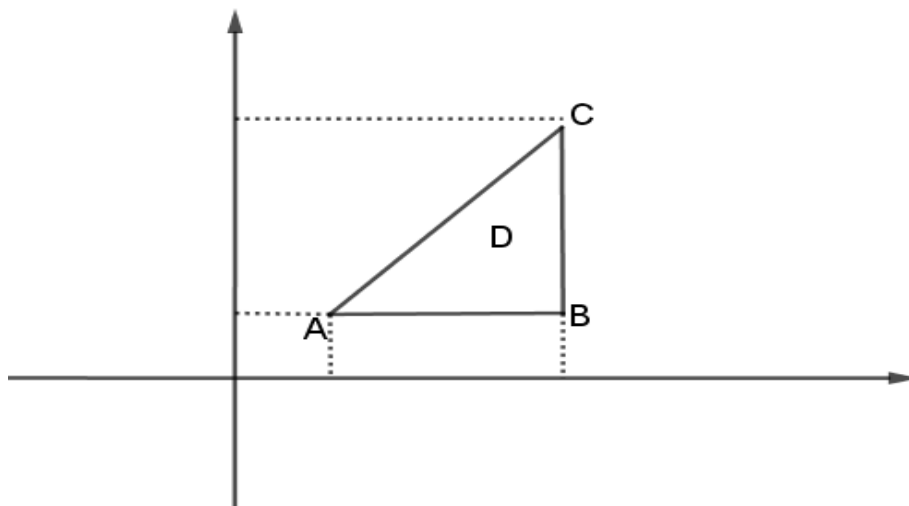
Run integrat... mhm...

```
C:\Users\HP\PycharmProjects\SymBOLic\venv\Scripts\python.exe C:\Users\HP\PycharmProjects\SymBOLic\ve
1 a=2
2 b=3
3 (12.0, 1.3322676295561878e-13)
4 Process finished with exit code 0
```

bu yerda a va b o'zgaruvchilarni ixtiyoriy kiritamiz.SciPy dan foydalanib biz ikki,uch va n o'lchovli integralni qiymatini ham topishimiz mumkin.

4-misol. $\iint_D (x-y)dx dy$ integralni hisoblang , bu yerda D :uchlari $A(1;1),B(3;1)$ va $C(3;3)$ nuqtalarda joylashgan uchburchak.

Yechilishi: D soha chapdan o'ngdan $x=1$ va $x=3$ to'g'ri chiziqlar bilan, quyidan $AB(y=1)$ to'g'ri chiziqlar bilan va yuqoridan $AC(y=x)$ to'g'ri chiziqlar bilan chegaralangan.Shu sababli integralni quyidagicha hisoblaymiz.



$$\iint_D (x - y) dx dy = \int_1^3 dx \int_1^x (x - y) dy = \int_1^3 \left(xy - \frac{y^2}{2} \right) \Big|_1^x dx = \frac{x^3}{6} - \frac{x^2}{2} + \frac{x}{2} \Big|_1^3 = \left(\frac{9}{2} - \frac{9}{2} + \frac{3}{2} \right) - \left(\frac{1}{6} - \frac{1}{2} + \frac{1}{2} \right) = \frac{4}{3}$$

Javob: $\frac{4}{3}$

```

1 from scipy.integrate import dblquad
2 def integrate(y, x):
3     return x - y
4 I= dblquad(integrate, a=1, b=3, lambda x: 1, lambda x: x)
5 print(I)
6
7
8
9

```

Run main

C:\Users\HP\PycharmProjects\SymBOLic\venv\Scripts\python.exe C:\Users\HP\Py...
(1.3333333333333335, 2.2108134835808846e-14)

Process finished with exit code 0

#Kerakli modullarni import qilamiz
#dblquad-ikki o‘lchovli integralni hisoblashda qo‘llaniladi
from scipy.integrate **import** dblquad
def integrate(y, x):
return (x - y)
ikki o‘lchovli integralni hisoblashda ushbu #dblquad (func , a , b ,lambda ,lambda) dan foydalanamiz
Parametrlar :
func chaqirilishi mumkin bo‘lgan funksiya
Python funktsiyasi yoki kamida ikkita o‘zgaruvchidan iborat usuli: y birinchi argument va x ikkinchi argument bo'lishi kerak.

```
# a, b float
# x dagi integrasiya chegaralari: a < b
# chaqirilishi mumkin yoki float
# lambda1 y dagi pastki chegara
# lambda2 y dagi yuqori chegara
# Y dagi yuqori chegara egri chizig'i
I = dblquad(integrate, 1, 3, lambda x: 1, lambda x: x)
print(I)
```

SymPy va SciPy dan foydalanish orqali integrallarni hisoblashda bir-biriga qaraganda ustunliklarni ko'rishimiz mumkin. Masalan SymPy kutubxonasi simvolik hisoblashni, SciPy kutubxonasi esa aniq qiymat chiqarishda turli integrallarni hisoblashni qo'llab quvatlaydi. Qaysi kutubxonadan foydalanishni integralning turiga va natijalarning talab qilgan formatiga qarab tanlash kerak bo'ladi.

Xulosa: Yuqoridagi fikr va mulohazalar natijasida xulosa qilib shuni aytish mumkinki fanlar o'rtasida o'zaro uzviy bog'liqlik o'rnatish hayotimizdagi ko'plab muammoli masalalarni hal qilishda oson va samarali usul bo'la oladi va albatta o'z o'rnida soha o'quvchilarining fanga bo'lgan qiziqishini orttiradi.

FOYDALANILGAN ADABIYOTLAR:

1. Ashurova M.M. (2021) Python dasturlash tili yordamida o'quvchilarga o'quv-didaktik materiallar yaratish va ulardan foydalanish metodikasi "Экономика и социум" 50-54 betlar.
2. Kuzmina M. A. (2017) The role of independent work in teaching a foreign language of students of technical university" Bulletin of MSRU. Series: Pedagogics 108-114 b.
3. <https://datascientest.com/en/python-the-most-popular-programming-language>
4. Musayev X., Soliev B. Public, Protected, Private Members In Python //Потомки Аль-Фаргани. – 2023. – Т. 1. – №. 1. – С. 43-46.
5. SH. M. X., M. S. A. pythonda dastur yozish qoidalari //so 'ngi ilmiy tadqiqotlar nazariyasi. – 2023. – т. 6. – №. 4. – с. 113-119.
6. <https://www.guru99.com/scipy-tutorial.html>