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YUQORI TARTIBLI ODDIY DIFFERENSIAL TENGLAMALARINI SONLI YECHIMLARINI HISOBBLASHDA PYTHON DASTURLASH TILI MODULLARINING QO'LLANISHI

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Ilmiy rahbar: Tatu Samarqand filiali fizika-matematika fanlar *doktori, professor*
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Anotatsiya: Ushbu maqola Yuqori tartibli differensial tenglamalarni yechishda zamonaviy Python kutubxonalaridan foydalanish hamda kollakatsiya usullari orqali samarali ishlashni ishlab chiqish.

ПРИМЕНЕНИЕ МОДУЛЕЙ ЯЗЫКА ПРОГРАММИРОВАНИЯ PYTHON ПРИ РАСЧЕТЕ ЧИСЛЕННЫХ РЕШЕНИЙ ОБЫКНОВЕННЫХ ДИФФЕРЕНЦИАЛЬНЫХ УРАВНЕНИЙ ВЫСОКОГО ПОРЯДКА

Аннотация: В данной статье обсуждается использование современных библиотек Python для решения дифференциальных уравнений высокого порядка и повышение эффективности работы с помощью методов коллокации.

APPLICATION OF PYTHON PROGRAMMING LANGUAGE MODULES IN CALCULATING NUMERICAL SOLUTIONS OF HIGH-ORDER ORDINARY DIFFERENTIAL EQUATIONS

Abstract: This paper discusses the use of modern Python libraries for solving high-order differential equations and the development of efficient performance through collocation methods.

1. $F(x, y^{(n)}) = 0$ ko'rinishdagi tenglamalar. Agar $F(x, u) = 0$ ko'rinishidagi tenglamalarni $u = \varphi(x)$ yoki $x = \psi(u)$ ga nisbatan yechish mumkin bo'lsa, $F(x, y^{(n)}) = 0$ ko'rinishidagi defferensial tenglamani ham integrallash mumkin.

Eng sodda n-tartibli tenglamalar. Quyidagi ko'rinishda bo'ladi. $y^{(n)} = f(x)$

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Python dasturlash tilida uchta kutubxona yordamida bu masalalarni grafik ham sonli yechimlarini toppish mumkin.

- ❖ Math -matematik kutubxona (matematik funksiyalarini ishlatish uchun).
- ❖ Networkx – tarmoqdagi mavjud fayllar ichidan saralashga hizmat qiladi,
- ❖ Matplotlib.pyplot- asoson grafika uchun bu chegaralari berilsa istalgan rasm animatsiyalarini hosil qilish uchun ishlatiladi.

Birnchi navbatta: **Rasmiy sayt** – www.python.org

Agar siz biror GNU/Linux distributivini ishlatayotgan bo'lsangiz ko'p hollarda sizning tizimingizda **python** o'rnatilgan bo'ladi. Buni tekshirib ko'rish uchun terminalingizdan quyidagi buyruqni ishga tushirib ko'ring.

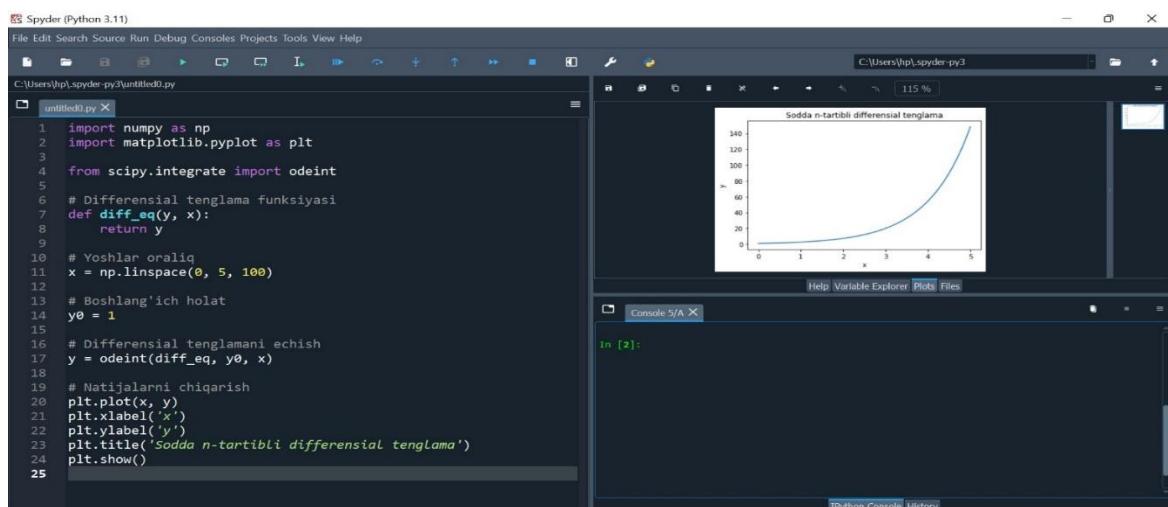
python -v

Agar sizda **Python 3.4.3** yozuvi yoki shunga o'xshash yozuv xosil bo'lsa unda xammasi joyida.

Windows operatsiyalar tizimigao'rnatish uchun www.python.org/downloads

web saxifasiga o'tamiz va u yerdan oxirgi python versiyasini yuklab olamiz. Pythonni o'rnatish odatiy dasturlarni o'rnatish kabi kechadi. Xech qanday qiyin joyi yo'q. Keyingi bosqichda python interpretatorini buyruqlar qatoridan (командной строки) ishga tushira olishimiz uchun biz **python** o'rnatilgan joy manzilini PATH deb nomlanuvchi o'zgaruvchiga qo'shib qo'yishimiz kerak bo'ladi.

Misol uchun python C:\Python34\ manzilida o'rnatilgan bo'lsin.



```

Spyder (Python 3.11)
File Edit Search Source Run Debug Consoles Projects Tools View Help
C:/Users/hp/spyder-py3/untitled0.py
untitled0.py
1 import numpy as np
2 import matplotlib.pyplot as plt
3
4 from scipy.integrate import odeint
5
6 # Differensial tenglama funksiyasi
7 def diff_eq(y, x):
8     return y
9
10 # Yoshlar oraliq
11 x = np.linspace(0, 5, 100)
12
13 # Boshlang'ich holat
14 y0 = 1
15
16 # Differensial tenglamani echish
17 y = odeint(diff_eq, y0, x)
18
19 # Natijalarini chiqarish
20 plt.plot(x, y)
21 plt.xlabel('x')
22 plt.ylabel('y')
23 plt.title('Sodda n-tartibili differensial tenglama')
24 plt.show()

```

*import numpy as np
import matplotlib.pyplot as plt*

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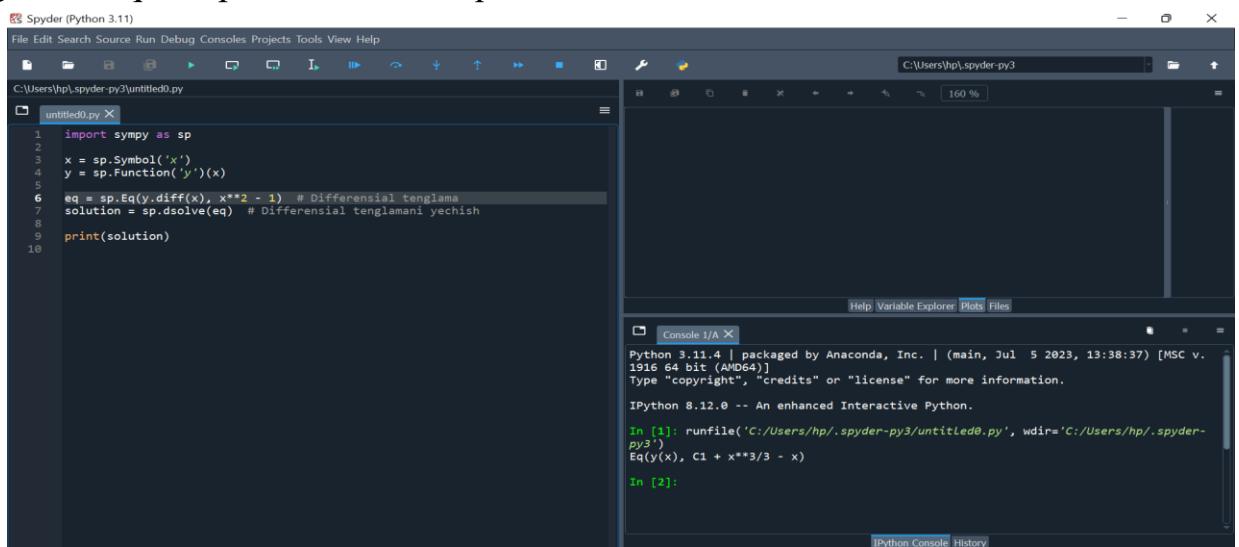
```

from scipy.integrate import odeint
# Differensial tenglama funksiyasi
def diff_eq(y, x):
    return y
# Yoshlar oraliq
x = np.linspace(0, 5, 100)
# Boshlang'ich holat
y0 = 1 # Differensial tenglamani echish
y = odeint(diff_eq, y0, x)
# Natijalarni chiqarish
plt.plot(x, y)
plt.xlabel('x')
plt.ylabel('y')
plt.title('Sodda n-tartibli differensial tenglama')
plt.show()

```

Ushbu dastur sodda birinchi tartibli differensial tenglama `dy/dx = y` yechimini topadi va natijadagi `y` qiymatlarini x bo'yicha chizishni ko'rsatadi. Dasturni ishga tushirishda, matplotlib va scipy kutubxonalarini o'rnatish yo'qotilmagan bo'lsa, ularni o'rnatishni unutmang.

Endi istalgan yuqori tartibli differensial tenglamani yechimini python dasturlash tilidagi kod orqali topishni ko'rib chiqamiz.



The screenshot shows the Spyder Python IDE interface. On the left, the code editor displays a file named 'untitled0.py' with the following content:

```

import sympy as sp
x = sp.Symbol('x')
y = sp.Function('y')(x)
eq = sp.Eq(y.diff(x), x**2 - 1) # Differensial tenglama
solution = sp.dsolve(eq) # Differensial tenglamani yechish
print(solution)

```

On the right, the IPython console window shows the execution of the code. It starts with the Python and IPython version information, followed by the output of the print statement:

```

Python 3.11.4 | packaged by Anaconda, Inc. | (main, Jul 5 2023, 13:38:37) [MSC v.
1916 64 bit (AMD64)]
Type "copyright", "credits" or "license" for more information.

IPython 8.12.0 -- An enhanced Interactive Python.

In [1]: runfile('C:/Users/hp/.spyder-py3/untitled0.py', wdir='C:/Users/hp/.spyder-
py3')
Eq(y(x), C1 + x**3/3 - x)

In [2]:

```

import sympy as sp

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```
x = sp.Symbol('x')
```

```
y = sp.Function('y')(x)
```

```
eq = sp.Eq(y.diff(x), x**2 - 1) # Differensial tenglama
```

```
solution = sp.dsolve(eq) # Differensial tenglamani yechish
```

```
print(solution)
```

*sp.Eq(y.diff(x), x**2 - 1) y.diff(x),x**2-1 const* sifatida elon qilingan buni biz istalgan tenglamani to'g'ri python kodlaridan foydalanib yozish kifoya. Qisqacha qilib aytganda istalgan yuqori tartibli differensial tenglamani yechish uchun Python dasturlash tilida funksiya va modular yetarlicha ulartdan to'g'ri foydalanib tenglamalarni oson ishlash mumkin.

FOYDALANILGAN ADABIYOTLAR RO'YXATI:

1) D.G.Raximov ."Differensial tenglamalar" (o'quv qo'llanma).-T.:''Nihol print'' OK,2021.-120b

2) Soatov Yo.U . Oliy matematika:Oliy texnika o'quv yurtlari talabalari uchun darslik; 5-Jild / Tahrir hayati:E.M.Xusanboev(ma'sul), A,Omonov, A.Abdukarimov, R.J.Isomov/ -T.; "O'qituvchi", 1997.-352 b.

3) Y.P.Oppog'ov. N.Turg'unov, I.A.Safarov. Oddiy differensial tenglamalardan misol va masalalar to'plami,-T.,2009

4) Sh.I.Tojiev, Oliy matematikadan masalarni yechish,-T.,"O'zbekiston",2002.

5) Sh.R. Xurramov Oliy matematika. Oliy ta'lim muassasalari uchun o'quv qo'llanma . 2-jild,-T.,"Fan va texnologiyalar", 2015, 300-bet