Іванов Кирил  
ФІТ 2-8

Варіант 8

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ⅈ | 0 | 1 | 2 | 3 | 4 |
| 𝑥 | 0,8 | 1 | 1,3 | 1,9 | 2,3 |
| 𝑦 | 1,72 | 2,35 | 1,52 | 2,43 | 1,55 |

Код

import numpy as np

from scipy.interpolate import CubicSpline

import matplotlib.pyplot as plt

x = np.array([0.8, 1, 1.3, 1.9, 2.3])

y = np.array([1.72, 2.35, 1.52, 2.43, 1.55])

n = len(x) - 1

h = np.diff(x)

a = y

b = np.zeros(n)

d = np.zeros(n)

c = np.zeros(n)

alpha = np.zeros(n)

for i in range(1, n):

alpha[i]= (3/h[i]) \* (a[i+1]-a[i]) - (3/h[i-1]) \* (a[i]-a [i-1])

l=np.ones(n)

mu = np.zeros(n)

z = np.zeros(n)

for i in range(1,n):

l[i]=2\*(x[i+1]-x[i-1])-h[i-1]\*mu[i-1]

mu[i]=h[i]/l[i]

z[i]=(alpha[i]-h[i-1]\*z[i-1])/l[i]

c[n-1]=0

b[n-1]=(a[n]-a[n-1])/h[n-1]-h[n-1]\*(2\*c[n-1]+c[n-2])/3

d[n-1]=(c[n-1]-c[n-2])/(3\*h[n-1])

for j in range(n-2,-1,-1):

c[j]=z[j]-mu[j]\*c[j+1]

b[j]=(a[j+1]-a[j])/h[j]-h[j]\*(c[j+1]+2\*c[j])/3

d[j]=(c[j+1]-c[j])/(3\*h[j])

for i in range(n):

print(f"Відрізок {i+1}:")

print(f"S\_{i}(x) = {a[i]} + {b[i].round(4)}(x - {x[i]}) + {c[i].round(4)}(x - {x[i]})^2 + {d[i].round(4)}(x - {x[i]})^3, x належить [{x[i]}, {x[i+1]}]")

x\_values = np.linspace(np.min(x), np.max(x), 100)

y\_values = []

for i in range(n):

mask = (x\_values >= x[i]) & (x\_values <= x[i +1])

x\_interval=x\_values[mask]

y\_interval=a[i]+b[i]\*(x\_interval-x[i])+c[i]\*(x\_interval-x[i])\*\*2+d[i]\*(x\_interval-x[i])\*\*3

y\_values.extend(y\_interval)

plt.figure(figsize=(8,8))

plt.plot(x\_values, y\_values, label="Кубічний сплайн", color='b')

plt.scatter(x, y, label="Задані точки", color='r')

plt.xlabel("x")

plt.ylabel("y")

plt.legend()

plt.grid()

plt.show()



