

Кроль Данило
ФІТ 2-16
Варіант 10

Код:

<https://colab.research.google.com/drive/1h7E5cf1IJCuQ5MAztzBh8cKqmH0nHPWf?usp=sharing>

Кроль ФІТ 2-16

B-10

x_i	-1	0	1	5	-0.5	1.5	2	2.5
$f(x_i)$	11	4	1	-1	?	?	?	?

$$L_3(x) = \frac{(x-x_1)(x-x_2)(x-x_3)}{(x_0-x_1)(x_0-x_2)(x_0-x_3)} y_0 + \frac{(x-x_0)(x-x_2)(x-x_3)}{(x_1-x_0)(x_1-x_2)(x_1-x_3)} y_1 +$$

$$+ \frac{(x-x_0)(x-x_1)(x-x_3)}{(x_2-x_0)(x_2-x_1)(x_2-x_3)} y_2 + \frac{(x-x_0)(x-x_1)(x-x_2)}{(x_3-x_0)(x_3-x_1)(x_3-x_2)} y_3$$

$$L_3(x) = \frac{(x-0)(x-1)(x-5)}{(-1-0)(-1-1)(-1-5)} \cdot 11 + \frac{(x+1)(x-1)(x-5)}{(0+1)(0-1)(0-5)} \cdot 4 +$$

$$+ \frac{(x+1)(x-0)(x-5)}{(1+1)(1-0)(1-5)} \cdot 1 + \frac{(x+1)(x-0)(x-1)}{(5+1)(5-0)(5-1)} \cdot (-1) =$$

$$= -x^3 + 5x^2 - x + 4$$

$$f(-0.5) \approx L_3(-0.5) = -(-0.5)^3 + 5(-0.5)^2 - (-0.5) + 4 \approx 5.875$$

$$f(1.5) \approx L_3(1.5) = 10.375$$

$$f(2) \approx L_3(2) = 14$$

$$f(2.5) \approx L_3(2.5) = 17.125$$

Б-10:

x	-0.5	1.5	2	2.5
$f(x)$	5.875	10.375	14	17.125



```
import matplotlib.pyplot as plt
import numpy as np
x=[-1.,0.,1.,5.]
y=[11.,4.,7.,-1.]
x_test = [-0.5,1.5,2.,2.5]

def lagrange_i(x, y, xt):
    n = len(x)
    ret = 0
    for i in range(n):
        tmp = []
        for j in range(n):
            if i == j:
                continue
            tmp.append(x[j])
        p_u = 1
        p_d = 1
        for px in tmp:
            p_u *= (xt - px)
            p_d *= (x[i] - px)
        ret += (p_u/p_d)*y[i]
    return ret

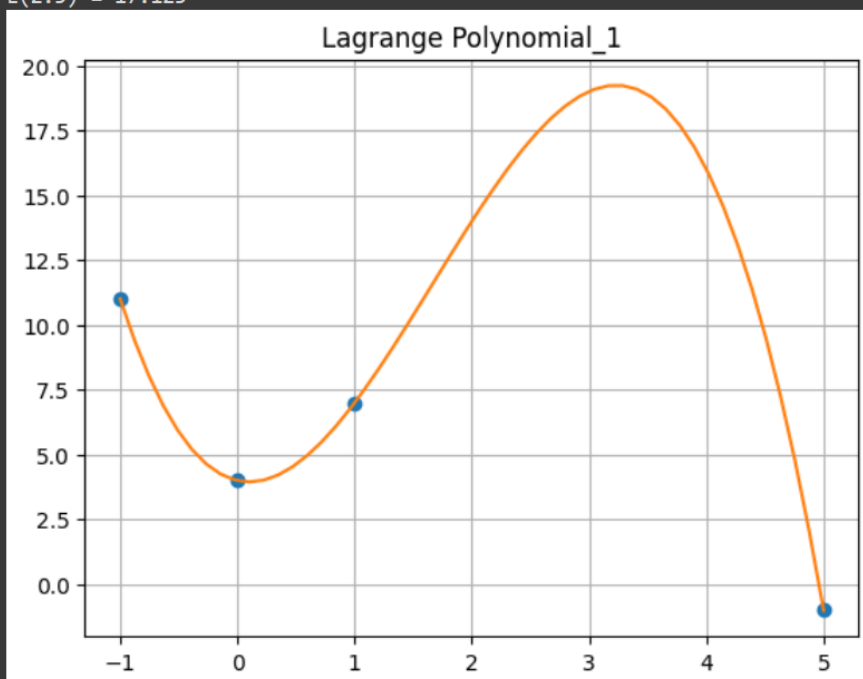
for xt in x_test:
    print(f"L({xt}) = {lagrange_i(x, y, xt)}")

x_range = np.linspace(min(x), max(x))
y_arr = [lagrange_i(x, y, i) for i in x_range]

plt.plot(x,y,'o',x_range,y_arr) #будуємо графік функції Лагранжа
plt.title('Lagrange Polynomial_1')
plt.grid(True)
plt.show()
```



```
L(-0.5) = 5.875
L(1.5) = 10.375
L(2.0) = 14.0
L(2.5) = 17.125
```



Перевірка:

```
from scipy.interpolate import lagrange

f = lagrange(x, y)
fig = plt.figure(figsize = (7,5))
plt.plot(x_range, f(x_range), 'b', x, y, 'ro')
plt.title('Lagrange Polynomial_2')
plt.grid()
plt.xlabel('x')
plt.ylabel('y')
plt.show()
```

