import numpy as np

import math

from math import factorial

import matplotlib.pyplot as plt

x = [3.50, 3.55, 3.60, 3.65, 3.70, 3.75, 3.80, 3.85, 3.90, 3.95, 4.00]

y = [33.1154, 34.8133, 36.5982, 38.4747, 40.4473, 42.5211, 44.7012,46.9931,49.4024,51.9354,54.5982]

x1 = 3.675

x2 = 3.852

h = x[1] - x[0]

q = (x1-x[0])/h

q1 = (x2-x[-1])/h

def f (y,j):

mas = []

for i in range(len(y)):

mas.append(y[i] - y[i-1])

mas.pop(0)

if j == 1:

return mas

else:

j-=1

return f(mas,j)

a1 = y[0] +q \* f(y,1)[0] +q \* (q-1)\* f(y,2)[0] / factorial(2) + q \*(q-1) \*(q-2) \*f(y,3)[0]/ factorial(3)

a2 = y[5] + q1\* f(y, 1)[4] +q1 \* (q1 +1)\* f (y,2)[3] / factorial(2) + q1 \* (q1 +1) \*(q1+2) \* f(y,3)[2]/factorial(3)

print("Newton's first interpolation formula: ", a1)

print("Newton's second interpolation formula: ", a2)

plt.plot(x,y, 'black')

plt.grid()

plt.show()