Q no 6:

fit a seond order polynomial parabola of the form y = ax^2 + bx + c to the following data by

dividing the data into 3 groups,

x = [

0,

20,

40,

60,

80,

100,

120,

140,

160,

180,

200

]

y = [98,

106,

112,

114,

113,

110,

102,

92,

79,

64,

47

]

import numpy as np

import pandas as pd

from pandas import DataFrame

import math

x,y,xx,xxx,xxxx,xy,xxy =[] ,[] ,[],[],[],[],[]

n = int(input("enter total number of elements:"))

for i in range(0,n):

x.append(int(input("x:")))

y.append(float(input("y: ")))

xx.append(x[i]\*\*2)

xxx.append(x[i]\*\*3)

xxxx.append(x[i]\*\*4)

xy.append(x[i]\*y[i])

xxy.append((x[i]\*\*2)\*y[i])

df = DataFrame({'X': x, 'Y': y, 'XX':xx, 'XXX':xxx, 'XXXX':xxxx, 'XY':xy, 'XXY':xxy })

print(df)

E\_x = np.sum(x)

E\_y = np.sum(y)

E\_xx = np.sum(xx)

E\_xxx = np.sum(xxx)

E\_xxxx = math.fsum(xxxx)

E\_xy = np.sum(xy)

E\_xxy = np.sum(xxy)

A = np.array([[E\_xxxx,E\_xxx,E\_xx],[E\_xxx,E\_xx,E\_x],[E\_xx,E\_x,n]])

print(A)

B = np.array([[E\_xxy],[E\_xy],[E\_y]])

print(B)

X = (np.linalg.inv(A)) @ B

print(X)

print(f'a:{X[0]} b:{X[1]} c:{X[2]}')

# X[0]==a

# X[1]==b

# X[2]==c

# y = ax^2 + b\*x + c

Y\_new = []

for i in range(0,n):

Y\_new.append(((X[0])\*(x[i]) \*\*2)+ (X[1]\*x[i]) + X[2])

print(Y\_new)

import matplotlib.pyplot as plt

plt.plot(x,y,"o",linestyle = "dotted")

plt.xlabel("x")

plt.ylabel("y")

plt.grid(True , linestyle = ":")

plt.show()

plt.plot(x,Y\_new,"o",linestyle = "dotted")

plt.xlabel("x")

plt.ylabel("Y\_new")

plt.grid(True , linestyle = ":")

plt.show()

X Y XX XXX XXXX XY XXY

0 0 98.0 0 0 0 0.0 0.0

1 20 106.0 400 8000 160000 2120.0 42400.0

2 40 112.0 1600 64000 2560000 4480.0 179200.0

3 60 114.0 3600 216000 12960000 6840.0 410400.0

4 80 113.0 6400 512000 40960000 9040.0 723200.0

5 100 110.0 10000 1000000 100000000 11000.0 1100000.0

6 120 102.0 14400 1728000 207360000 12240.0 1468800.0

7 140 92.0 19600 2744000 384160000 12880.0 1803200.0

8 160 79.0 25600 4096000 655360000 12640.0 2022400.0

9 180 64.0 32400 5832000 1049760000 11520.0 2073600.0

10 200 47.0 40000 8000000 1600000000 9400.0 1880000.0

[[4.05328e+09 2.42000e+07 1.54000e+05]

[2.42000e+07 1.54000e+05 1.10000e+03]

[1.54000e+05 1.10000e+03 1.10000e+01]]

[[1.17032e+07]

[9.21600e+04]

[1.03700e+03]]

[[-3.69172494e-03]

[ 4.76072261e-01]

[ 9.83496503e+01]]

a:[-0.00369172] b:[0.47607226] c:[98.34965035]

[array([98.34965035]), array([106.39440559]), array([111.48578089]), array([113.62377622]), array([112.80839161]), array([109.03962704]), array([102.31748252]), array([92.64195804]), array([80.01305361]), array([64.43076923]), array([45.8951049])]



