assignment08

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0.0.1 Linear regression

0.0.2 Name : Park Jinhyuk

0.0.3 Student-ID : 20141775

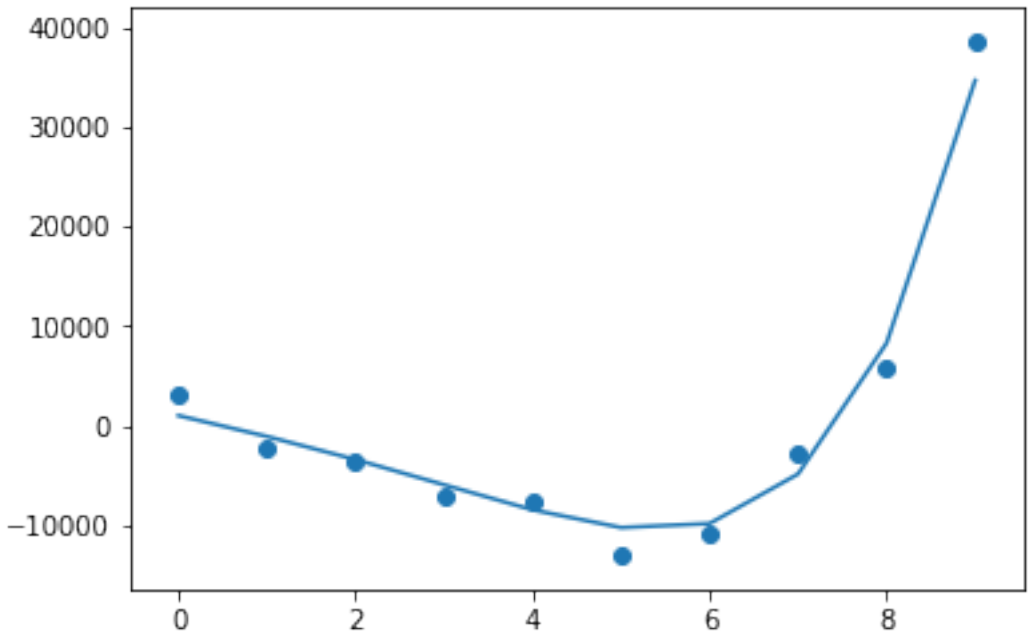
In [34]:
```
import matplotlib.pyplot as plt
import numpy as np
import random

arraySize = 10
noiseSize = 4000

graph_x = np.arange(arraySize)
graph_y = np.zeros(arraySize)
noise = np.zeros(arraySize)

for i in range(arraySize):
    graph_y[i] = 2*(i**5) - 10*(i**4) + 10*(i**3) - 100*(i**2) - 2000*i + 1000
    noise[i] = random.randrange(-noiseSize, noiseSize)

plt.plot(graph_x, graph_y)
plt.scatter(graph_x, graph_y+noise)
plt.show()
```

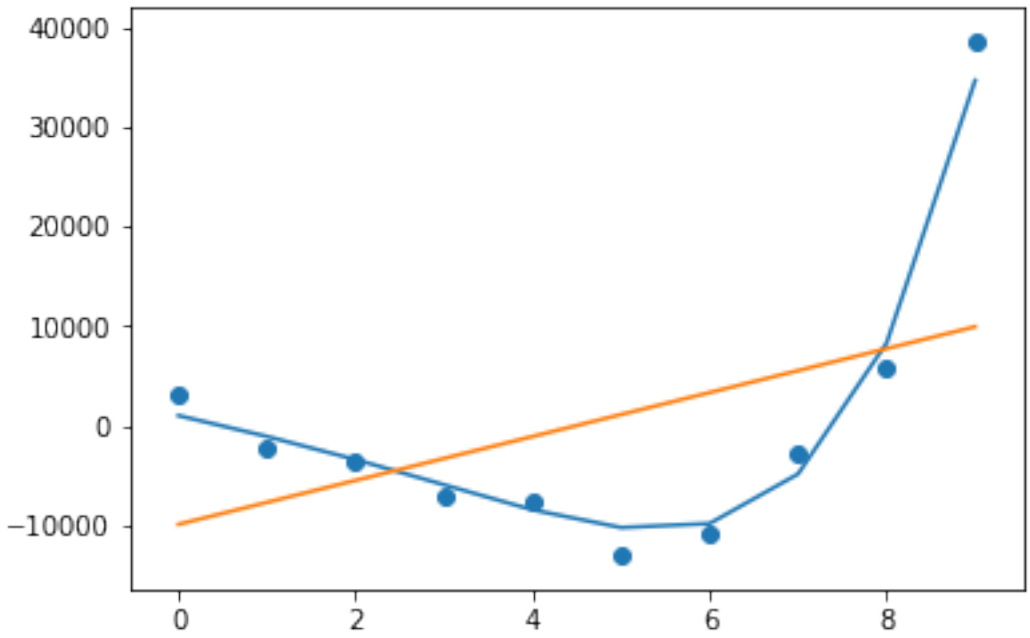


In [35]:
```
d = 1

A = np.zeros((arraySize, d+1))
B = np.zeros(arraySize)
X = np.zeros(d+1)
Y = np.zeros(arraySize)
for i in range(arraySize):
    A[i:] = 1, graph_x[i]
    B[i] = graph_y[i]+noise[i]


X = np.dot(np.dot(np.linalg.inv(np.dot(A.T, A)), A.T), B)
for i in range(arraySize):
    Y[i] = X[0] + i*X[1]

plt.plot(graph_x, graph_y)
plt.scatter(graph_x, graph_y+noise)
plt.plot(graph_x, Y)
plt.show()
```

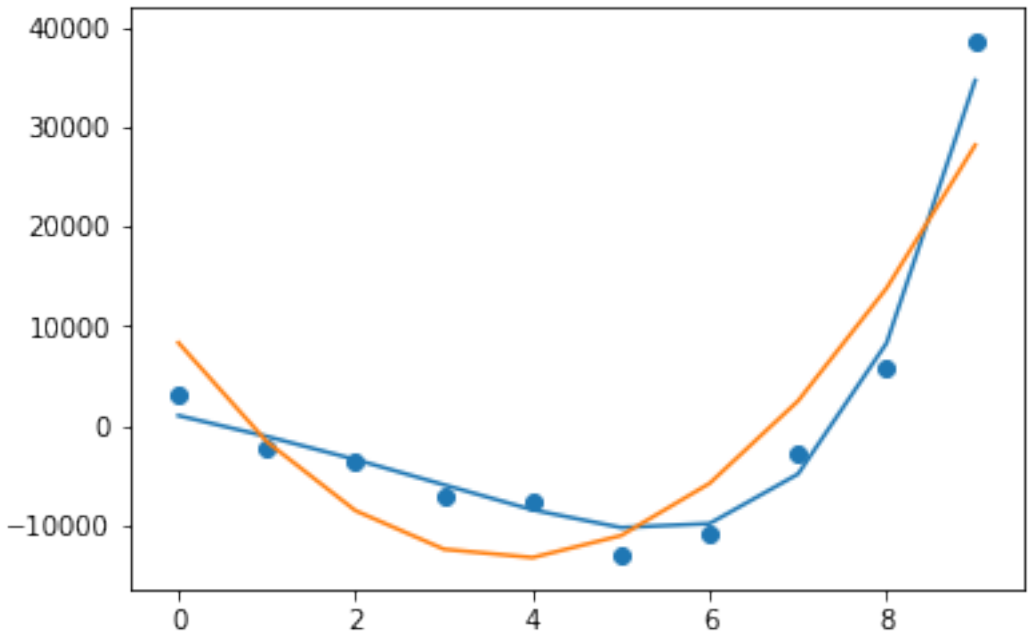


In [36]:
```
d = 2

A = np.zeros((arraySize, d+1))
B = np.zeros(arraySize)
X = np.zeros(d+1)
Y = np.zeros(arraySize)
for i in range(arraySize):
    A[i:] = 1, graph_x[i], graph_x[i]**2
    B[i] = graph_y[i]+noise[i]


X = np.dot(np.dot(np.linalg.inv(np.dot(A.T, A)), A.T), B)
for i in range(arraySize):
    Y[i] = X[0] + i*X[1] + (i**2)*X[2]

plt.plot(graph_x, graph_y)
plt.scatter(graph_x, graph_y+noise)
plt.plot(graph_x, Y)
plt.show()
```

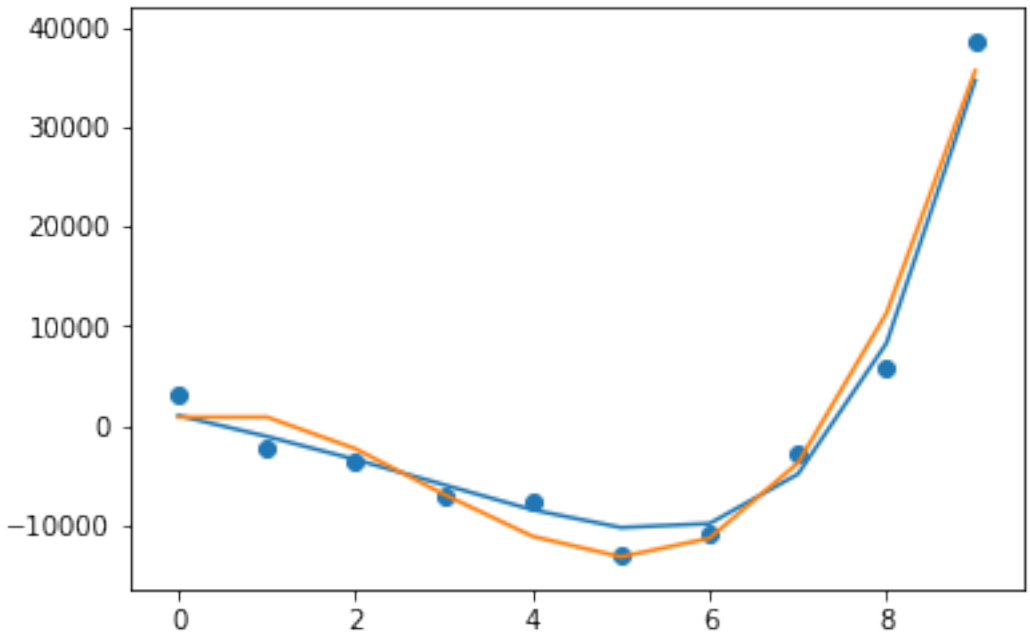


In [37]:
```
d = 3

A = np.zeros((arraySize, d+1))
B = np.zeros(arraySize)
X = np.zeros(d+1)
Y = np.zeros(arraySize)
for i in range(arraySize):
    A[i:] = 1, graph_x[i], graph_x[i]**2, graph_x[i]**3
    B[i] = graph_y[i]+noise[i]


X = np.dot(np.dot(np.linalg.inv(np.dot(A.T, A)), A.T), B)
for i in range(arraySize):
    Y[i] = X[0] + i*X[1] + (i**2)*X[2] + (i**3)*X[3]

plt.plot(graph_x, graph_y)
plt.scatter(graph_x, graph_y+noise)
plt.plot(graph_x, Y)
plt.show()
```

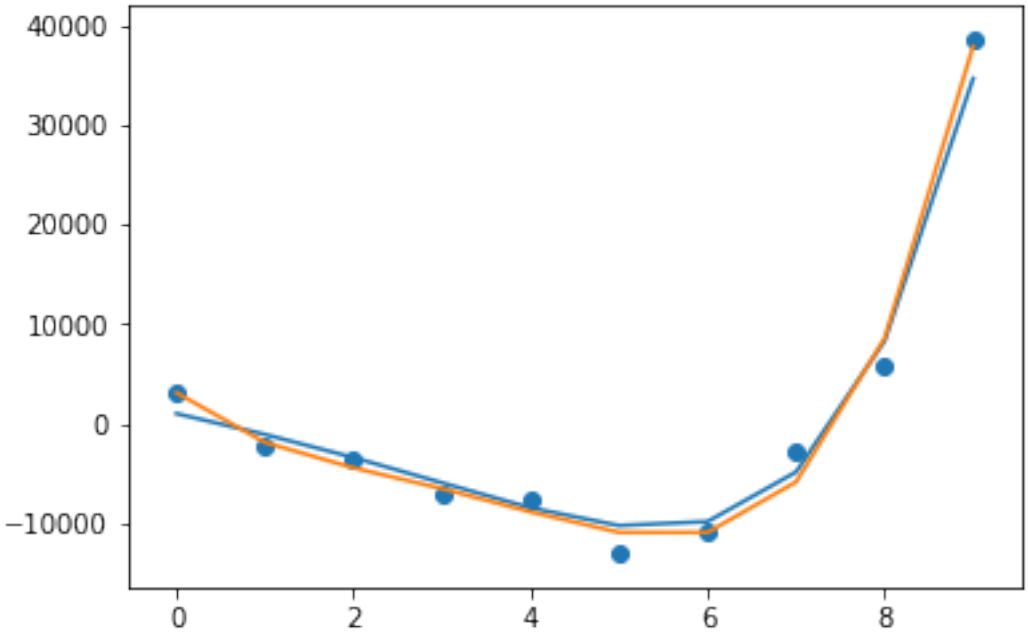


In [38]:
```
d = 4

A = np.zeros((arraySize, d+1))
B = np.zeros(arraySize)
X = np.zeros(d+1)
Y = np.zeros(arraySize)
for i in range(arraySize):
    A[i:] = 1, graph_x[i], graph_x[i]**2, graph_x[i]**3, graph_x[i]**4
    B[i] = graph_y[i]+noise[i]


X = np.dot(np.dot(np.linalg.inv(np.dot(A.T, A)), A.T), B)
for i in range(arraySize):
    Y[i] = X[0] + i*X[1] + (i**2)*X[2] + (i**3)*X[3] + (i**4)*X[4]

plt.plot(graph_x, graph_y)
plt.scatter(graph_x, graph_y+noise)
plt.plot(graph_x, Y)
plt.show()
```


40000
30000
20000
10000
0
−10000
0
2
4
6
8