In [1]:

```
#importing Libraries
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
```

In [2]:

```
#importing Dataset
df = pd.read_csv("Position_Salaries.csv")
```

In [3]:

```
#View The Data
df.head()
```

Out[3]:

	Position	Level	Salary
0	Business Analyst	1	45000
1	Junior Consultant	2	50000
2	Senior Consultant	3	60000
3	Manager	4	80000
4	Country Manager	5	110000

In [4]:

```
#View The Data Info
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10 entries, 0 to 9
Data columns (total 3 columns):
 #   Column    Non-Null Count  Dtype 
---  ------    --------------  ----- 
 0   Position  10 non-null     object
 1   Level     10 non-null     int64 
 2   Salary    10 non-null     int64 
dtypes: int64(2), object(1)
memory usage: 368.0+ bytes
```

In [5]:

```
#View The Shape of Data
df.shape
```

Out[5]:

```
(10, 3)
```

In [6]:

```
#Check if There is Any NULl Values in Data
df.isnull().sum()
```

Out[6]:

```
Position    0
Level       0
Salary      0
dtype: int64
```

In [7]:

```
#Defining Features & Label of Data
X = df.iloc[:, 1:2].values
y = df.iloc[:, 2].values
```

In [8]:

```
#X is a Matrix
X
```

Out[8]:

```
array([[ 1],
       [ 2],
       [ 3],
       [ 4],
       [ 5],
       [ 6],
       [ 7],
       [ 8],
       [ 9],
       [10]], dtype=int64)
```

In [9]:

```
#Y is a Vector
y
```

Out[9]:

```
array([  45000,   50000,   60000,   80000,  110000,  150000,  200000,
        300000,  500000, 1000000], dtype=int64)
```

We're not going to Split the dataset cause, our Dataset is small

Fitting Linear Regression to the Dataset

In [13]:

```
#Import Linear Regression
from sklearn.linear_model import LinearRegression

lin_reg = LinearRegression()
```

In [14]:

```
#Fit Data into Linear Regression
lin_reg.fit(X, y)
```

Out[14]:

```
LinearRegression()
```

In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.

In [15]:

```
X
```

Out[15]:

```
array([[ 1],
       [ 2],
       [ 3],
       [ 4],
       [ 5],
       [ 6],
       [ 7],
       [ 8],
       [ 9],
       [10]], dtype=int64)
```

Fitting Polynomial Regression to the Dataset

In [16]:
```
#Import Polynomial Features
from sklearn.preprocessing import PolynomialFeatures

poly_reg = PolynomialFeatures(degree = 4) #You can Change The Degree Values Upper/Lower to Experience Best Result
```

In [17]:
```
#Fit Data into Polynomial Features
X_poly = poly_reg.fit_transform(X)
```

In [18]:
```
X_poly
```

Out[18]:
```
array([[1.000e+00, 1.000e+00, 1.000e+00, 1.000e+00, 1.000e+00],
       [1.000e+00, 2.000e+00, 4.000e+00, 8.000e+00, 1.600e+01],
       [1.000e+00, 3.000e+00, 9.000e+00, 2.700e+01, 8.100e+01],
       [1.000e+00, 4.000e+00, 1.600e+01, 6.400e+01, 2.560e+02],
       [1.000e+00, 5.000e+00, 2.500e+01, 1.250e+02, 6.250e+02],
       [1.000e+00, 6.000e+00, 3.600e+01, 2.160e+02, 1.296e+03],
       [1.000e+00, 7.000e+00, 4.900e+01, 3.430e+02, 2.401e+03],
       [1.000e+00, 8.000e+00, 6.400e+01, 5.120e+02, 4.096e+03],
       [1.000e+00, 9.000e+00, 8.100e+01, 7.290e+02, 6.561e+03],
       [1.000e+00, 1.000e+01, 1.000e+02, 1.000e+03, 1.000e+04]])
```

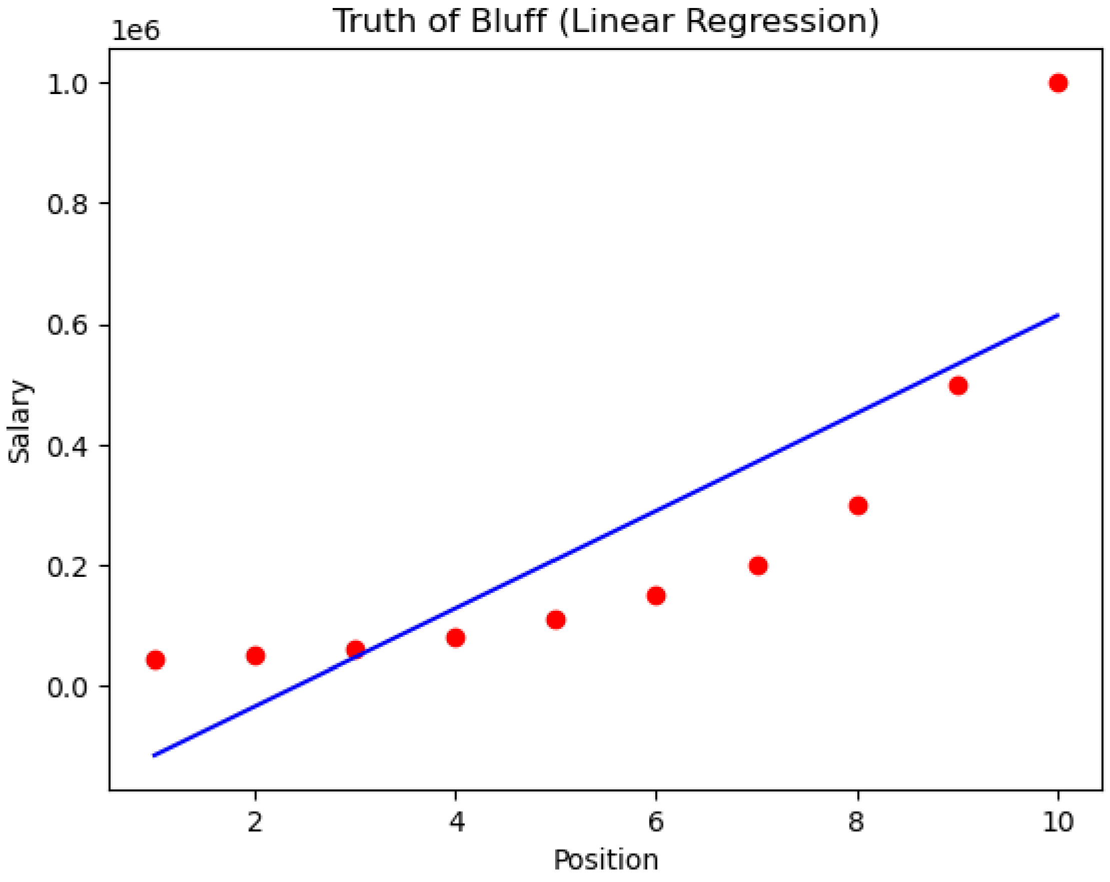
In [19]:
```
#Fit The Polynomial Regression Object to a new Linear Regression Object
lin_reg2 = LinearRegression()

lin_reg2.fit(X_poly, y)
```

Out[19]:
```
LinearRegression()
```

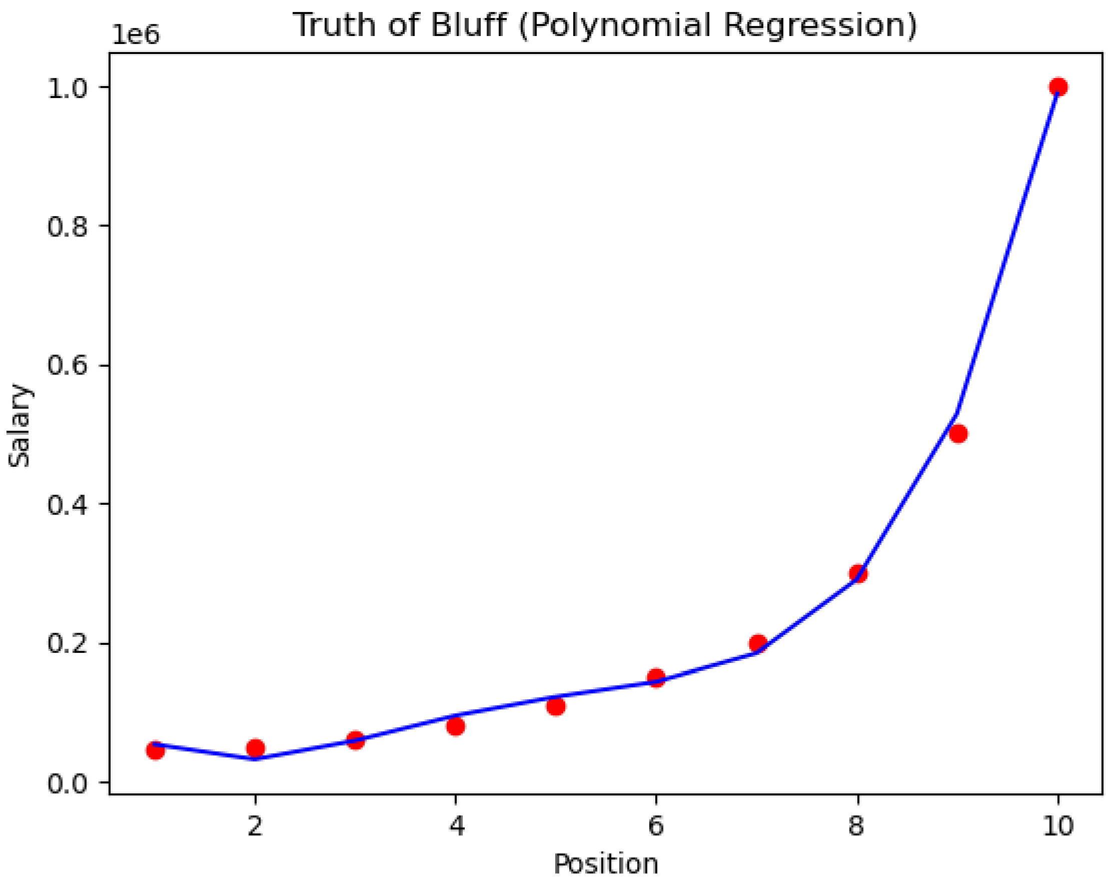
In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.

In [20]:

```
#Visualizing The Linear Regression Results
plt.scatter(X, y,
            color = 'red')
plt.plot(X, lin_reg.predict(X), color = 'blue') #Original Feature and Linear Regression's Feature
plt.title("Truth of Bluff (Linear Regression)")
plt.xlabel("Position")
plt.ylabel("Salary")
plt.show()
```



```
In [21]:  #Visualizing The Polynimoal Regression Results
          plt.scatter(X, y,
                      color = 'red')
          plt.plot(X, lin_reg2.predict(poly_reg.fit_transform(X)), color = 'blue') #Original Feature and Linear Regression's Feature
          plt.title("Truth of Bluff (Polynomial Regression)")
          plt.xlabel("Position")
          plt.ylabel("Salary")
          plt.show()
```

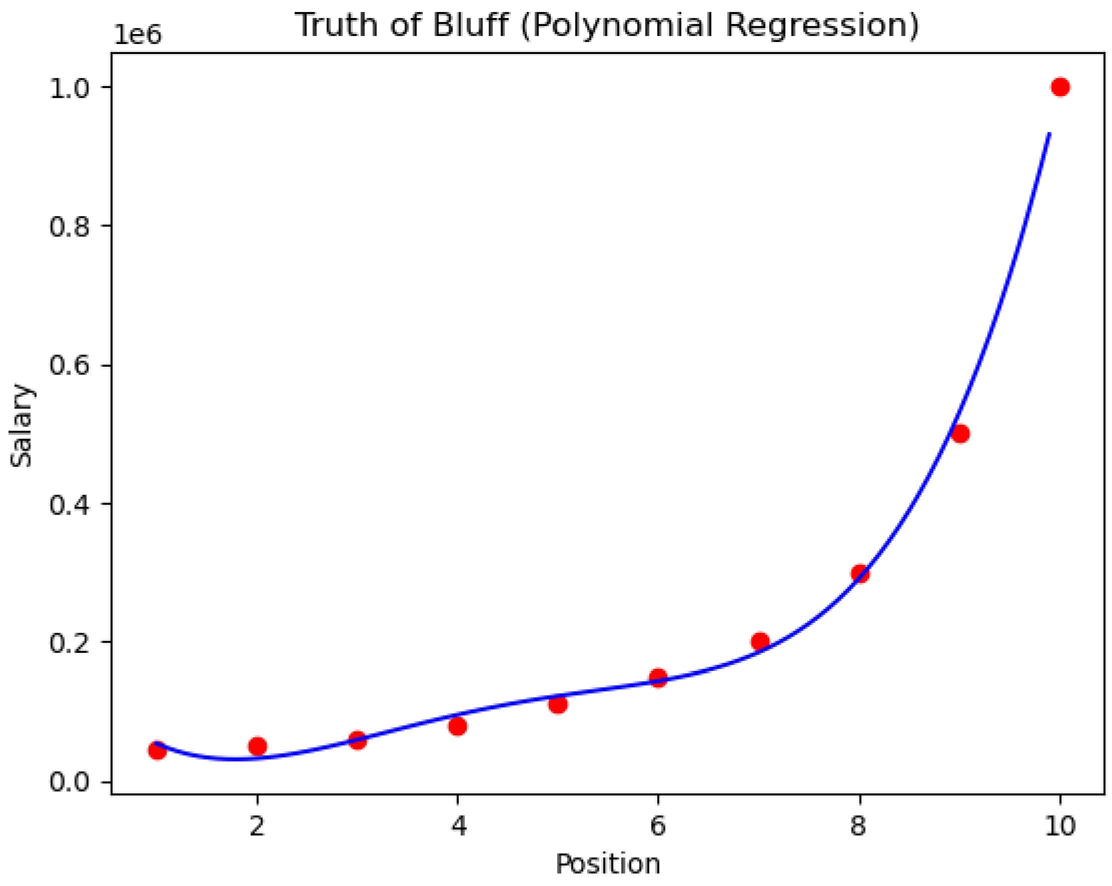


We've better results now but still experienced that, we still have little linear line between point-point observations. To get rid of it, follow the process

```
In [22]:  #Create a new X which contain incremental steps between the level with resolution 0.1 (Small Steps)
          #np.arrange(Lower Bound(X), Upper Bound(X), Incrementation)
          X_grid = np.arange(min(X), max(X), 0.1)

          #This Will Give us a Vector but We Need Actually Matrix

          #Convert The Vector into Matrix
          X_grid = X_grid.reshape(len(X_grid), 1) #1 is the Number of Column
```

In [23]:

```
plt.scatter(X, y,
            color = 'red')
plt.plot(X_grid, lin_reg2.predict(poly_reg.fit_transform(X_grid)), color = 'blue') #Original Feature and Linear Regression's Feature
plt.title("Truth of Bluff (Polynomial Regression)")
plt.xlabel("Position")
plt.ylabel("Salary")
plt.show()
```



In [30]:

```
#Predict a New Result With Linear Regression
lin_reg.predict([[6.5]]) #Drop the Level Point
```

Out[30]:

```
array([330378.78787879])
```

In [31]:

```
#Predict a New Result With Polynomial Regression
lin_reg2.predict(poly_reg.fit_transform([[6.5]]))
```

Out[31]:

```
array([158862.45265157])
```