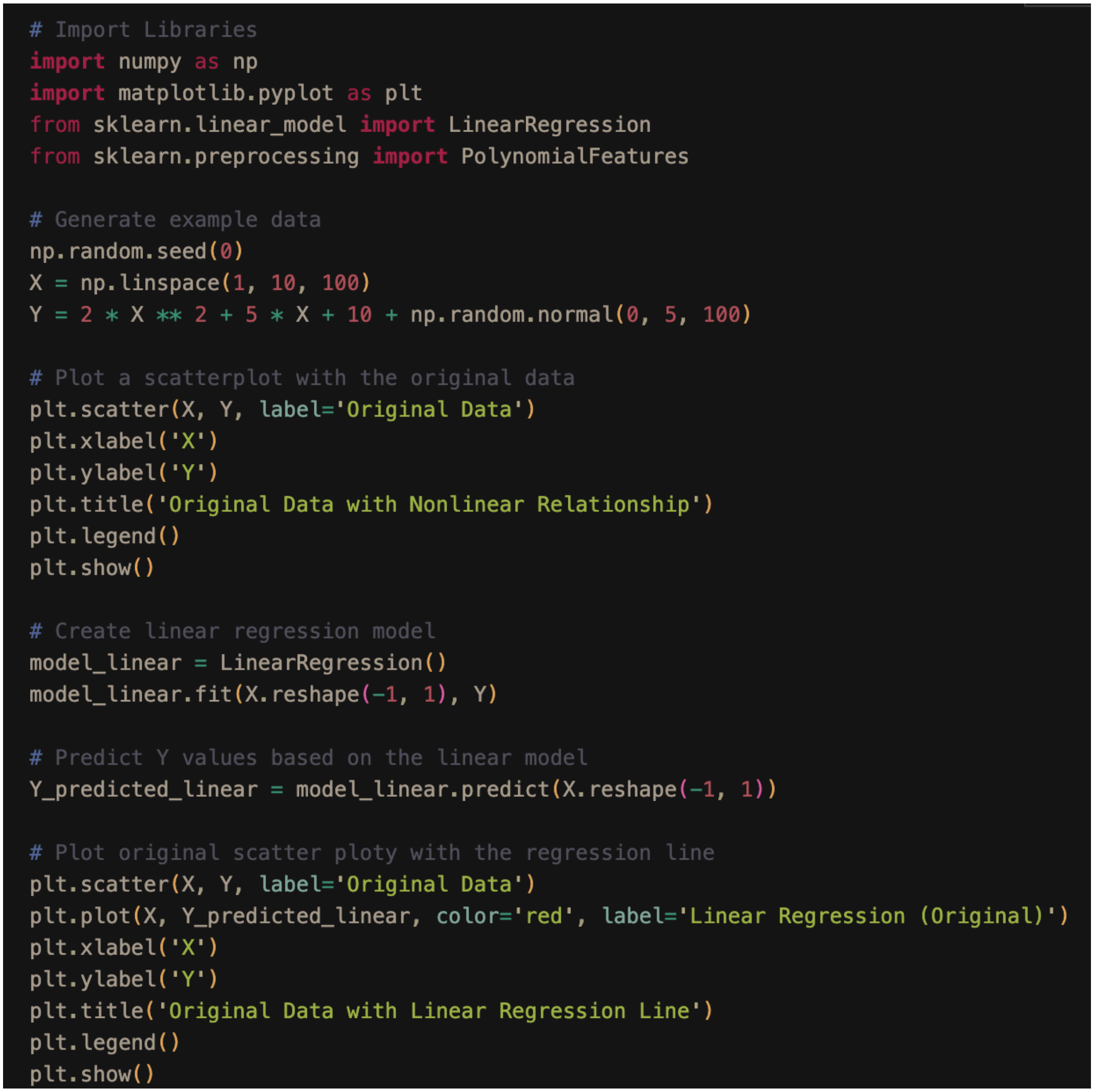
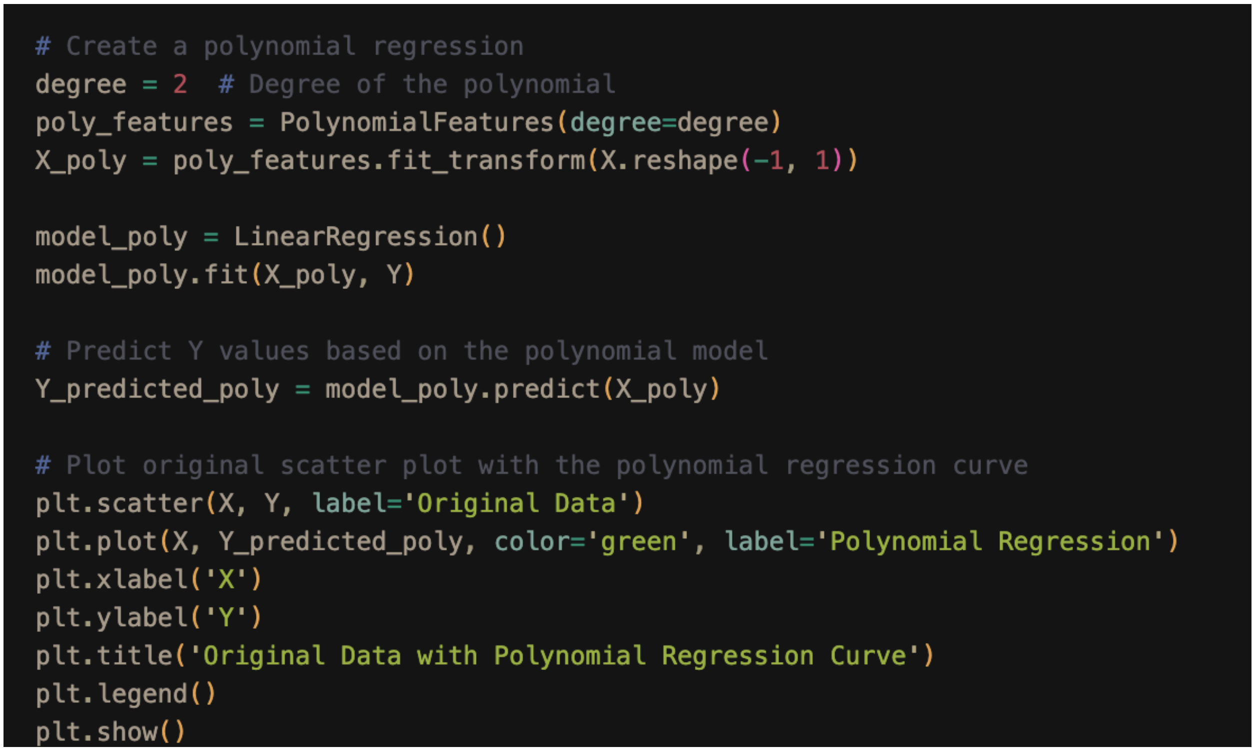
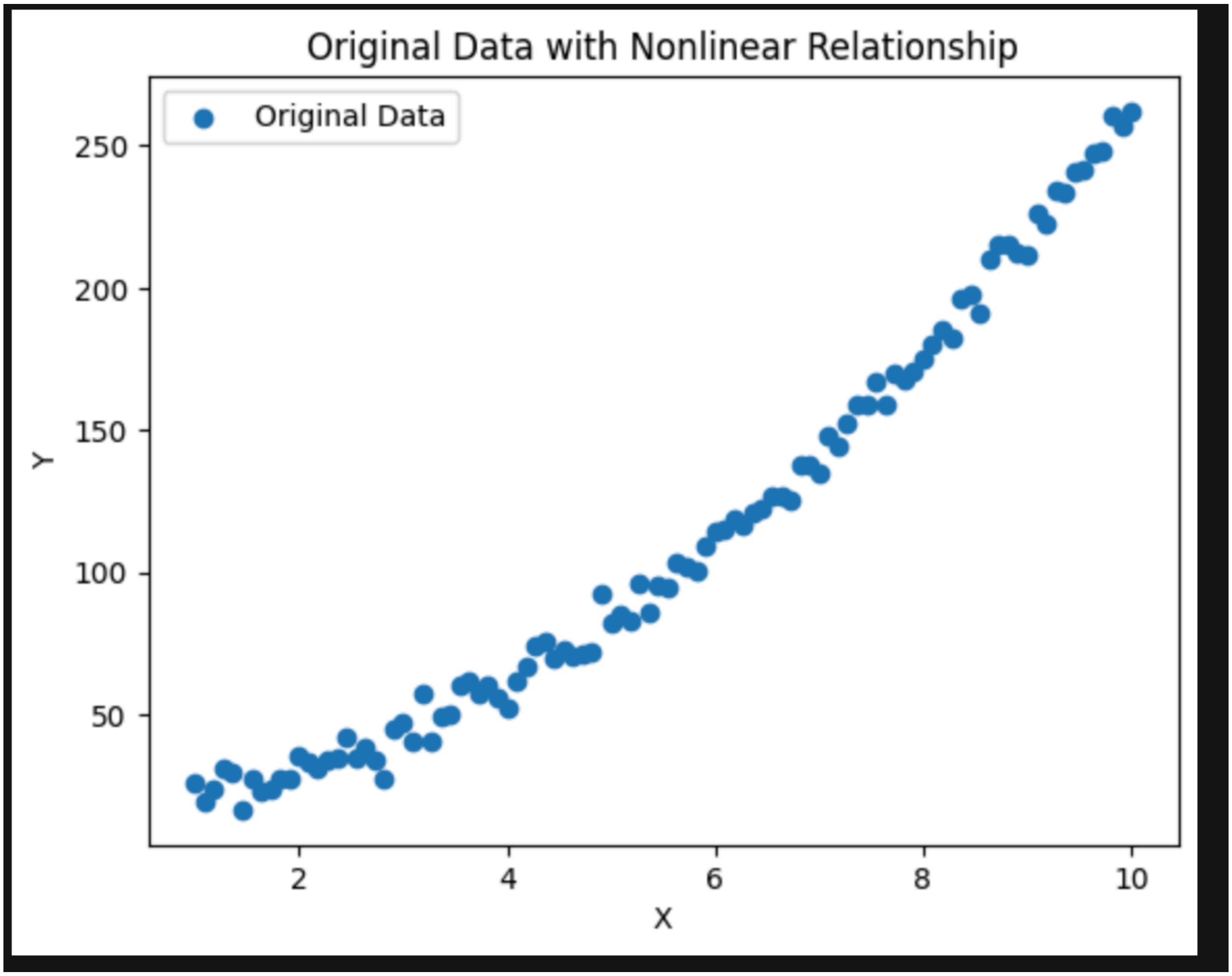
T7D2 Discussion

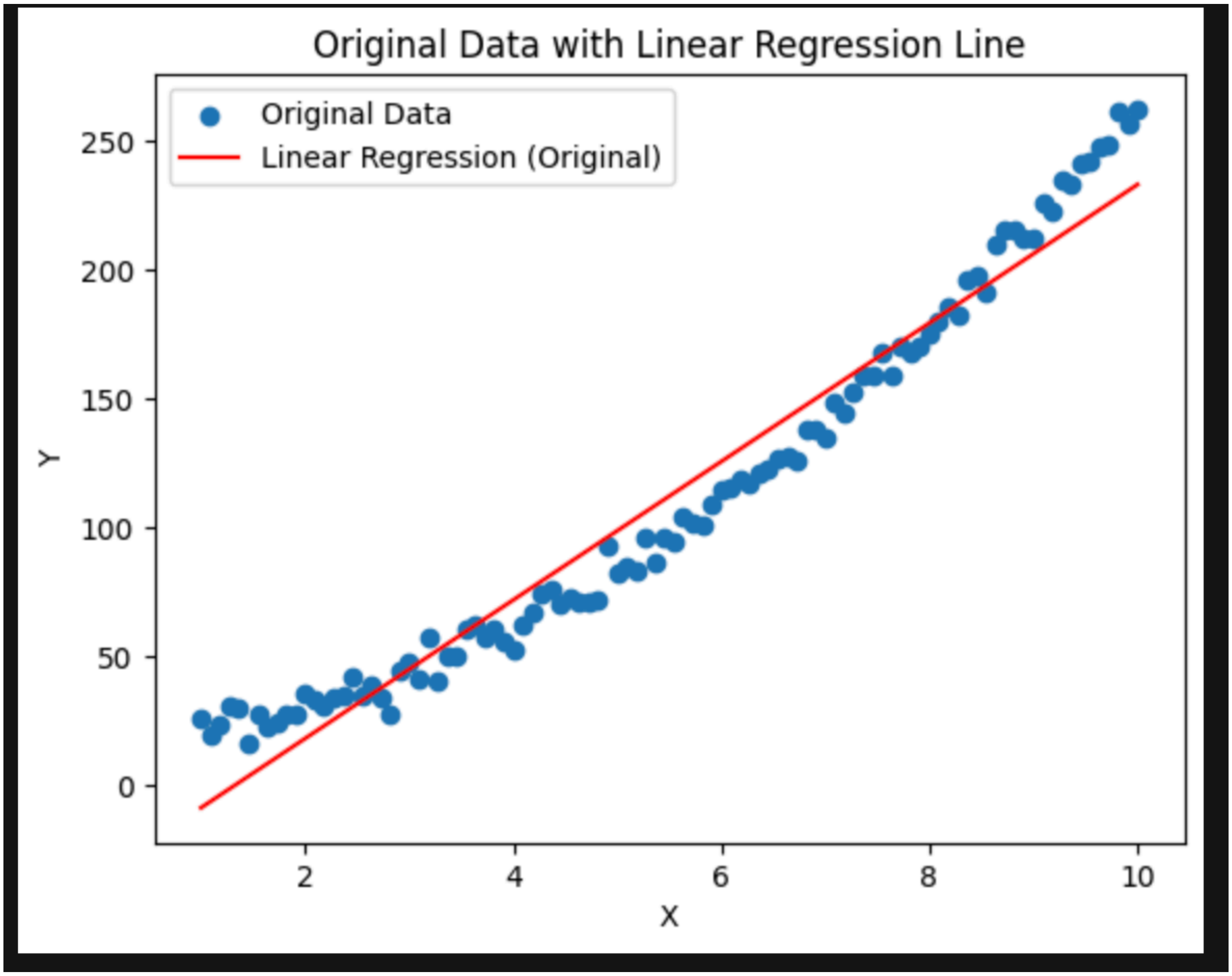


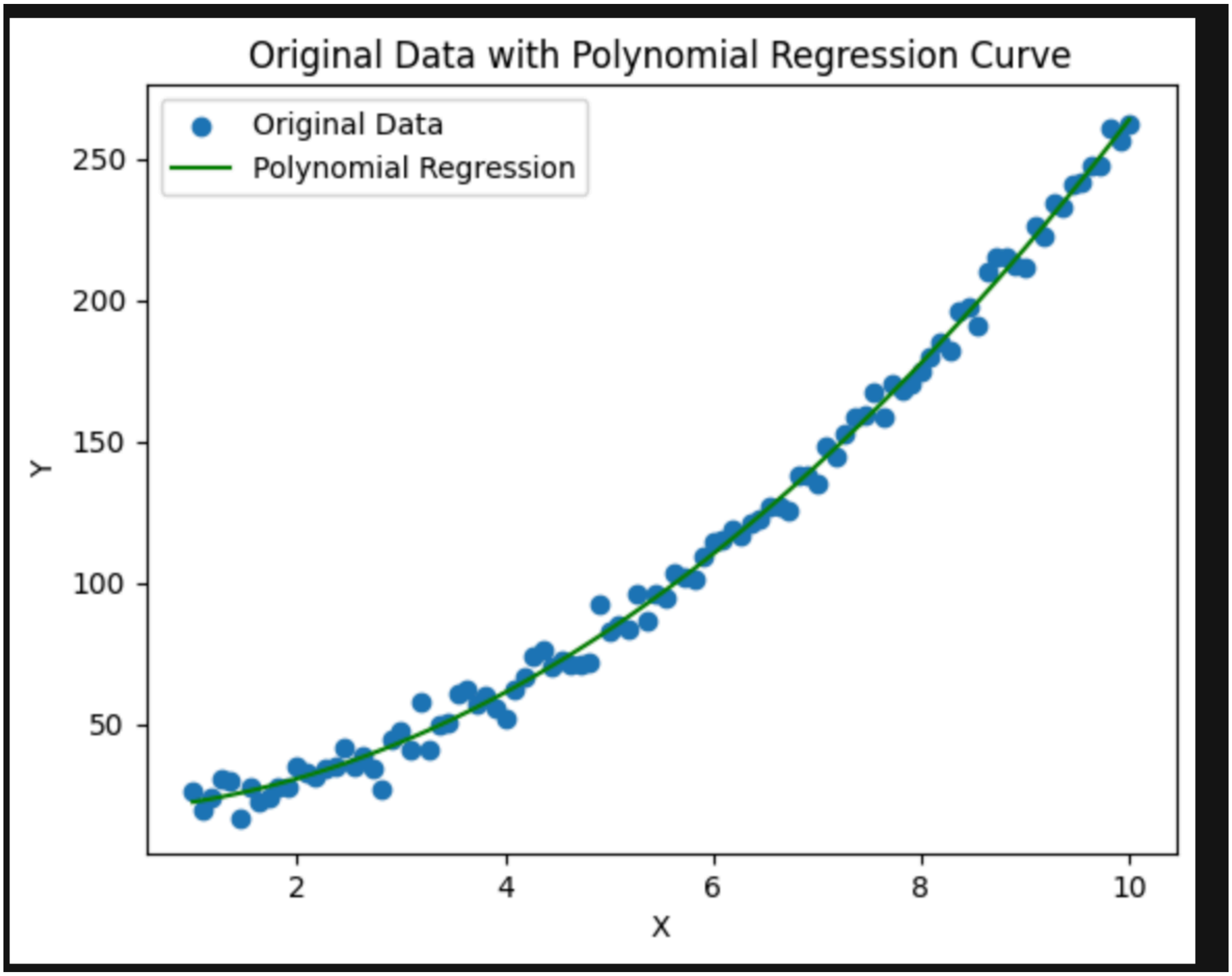
```
# Import Libraries
import numpy as np
import matplotlib.pyplot as plt
from sklearn.linear_model import LinearRegression
from sklearn.preprocessing import PolynomialFeatures

# Generate example data
np.random.seed(0)
X = np.linspace(1, 10, 100)
Y = 2 * X ** 2 + 5 * X + 10 + np.random.normal(0, 5, 100)

# Plot a scatterplot with the original data
plt.scatter(X, Y, label='Original Data')
plt.xlabel('X')
plt.ylabel('Y')
plt.title('Original Data with Nonlinear Relationship')
plt.legend()
plt.show()

# Create linear regression model
model_linear = LinearRegression()
model_linear.fit(X.reshape(-1, 1), Y)

# Predict Y values based on the linear model
Y_predicted_linear = model_linear.predict(X.reshape(-1, 1))

# Plot original scatter ploty with the regression line
plt.scatter(X, Y, label='Original Data')
plt.plot(X, Y_predicted_linear, color='red', label='Linear Regression (Original)')
plt.xlabel('X')
plt.ylabel('Y')
plt.title('Original Data with Linear Regression Line')
plt.legend()
plt.show()
```



```
# Create a polynomial regression
degree = 2  # Degree of the polynomial
poly_features = PolynomialFeatures(degree=degree)
X_poly = poly_features.fit_transform(X.reshape(-1, 1))

model_poly = LinearRegression()
model_poly.fit(X_poly, Y)

# Predict Y values based on the polynomial model
Y_predicted_poly = model_poly.predict(X_poly)

# Plot original scatter plot with the polynomial regression curve
plt.scatter(X, Y, label='Original Data')
plt.plot(X, Y_predicted_poly, color='green', label='Polynomial Regression')
plt.xlabel('X')
plt.ylabel('Y')
plt.title('Original Data with Polynomial Regression Curve')
plt.legend()
plt.show()
```


Original Data with Nonlinear Relationship
Original Data
250
200
150
100
50
Y
2
4
6
8
10
X


Original Data with Linear Regression Line
Original Data
Linear Regression (Original)
250
200
150
100
50
0
Y
2
4
6
8
10
X


Original Data with Polynomial Regression Curve
Original Data
Polynomial Regression
250
200
150
100
50
Y
2
4
6
8
10
X