```
import numpy as np
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error, r2_score
import matplotlib.pyplot as plt
```

```
np.random.seed(0)
X = np.random.rand(100, 1) * 10
y = 2 * X + 1 + np.random.randn(100, 1)
```

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
```

```
model = LinearRegression()
model.fit(X_train, y_train)
```

LinearRegression

LinearRegression()

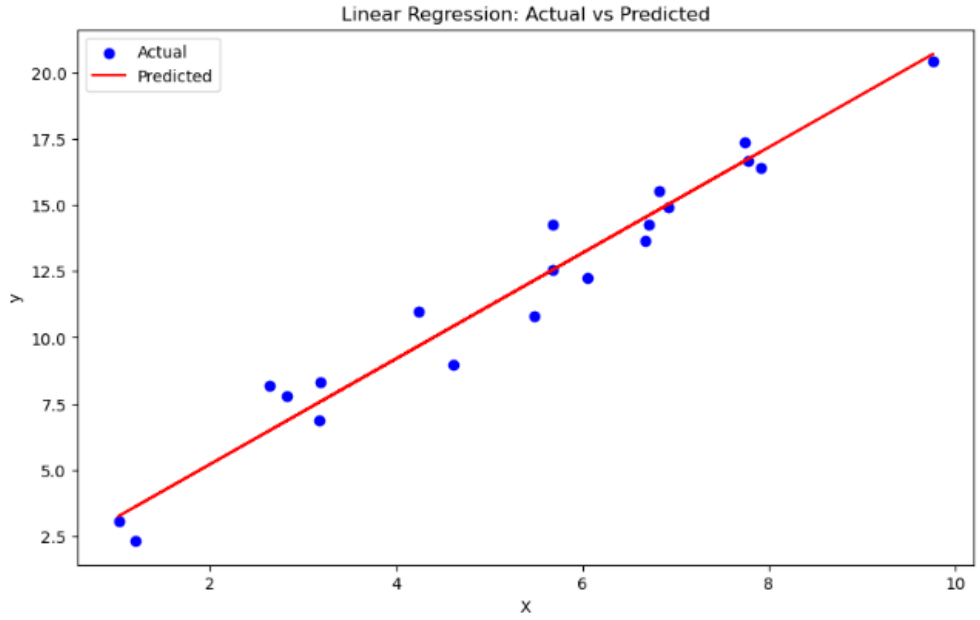
```
y_pred = model.predict(X_test)
```

```
mse = mean_squared_error(y_test, y_pred)
r2 = r2_score(y_test, y_pred)
```

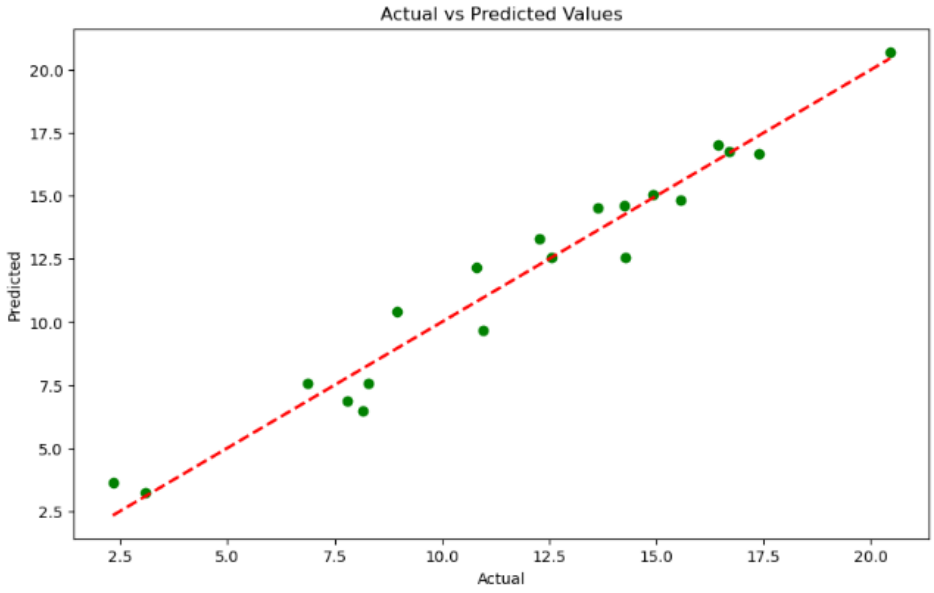
```
print(f"Mean Squared Error: {mse:.4f}")
print(f"R-squared Score: {r2:.4f}")
```

```
Mean Squared Error: 0.9178
R-squared Score: 0.9577
```

```
plt.figure(figsize=(10, 6))
plt.scatter(X_test, y_test, color='blue', label='Actual')
plt.plot(X_test, y_pred, color='red', label='Predicted')
plt.xlabel('X')
plt.ylabel('y')
plt.title('Linear Regression: Actual vs Predicted')
plt.legend()
plt.show()
```




```
plt.figure(figsize=(10, 6))
plt.scatter(y_test, y_pred, color='green')
plt.plot([y_test.min(), y_test.max()], [y_test.min(), y_test.max()], 'r--', lw=2)
plt.xlabel('Actual')
plt.ylabel('Predicted')
plt.title('Actual vs Predicted Values')
plt.show()
```




```
residuals = y_test - y_pred
```

```
plt.figure(figsize=(10, 6))
plt.hist(residuals, bins=20, edgecolor='black')
plt.xlabel('Residuals')
plt.ylabel('Frequency')
plt.title('Histogram of Residuals')
plt.show()
```