Output

PART 1: Custom vs Scikit-Learn Decision Tree (Iris Dataset)

```
Custom Decision Tree Accuracy: 1.0000
```

```
Scikit-learn Decision Tree Accuracy: 1.0000
```

```
Accuracy Comparison:
Custom Decision Tree: 1.0000
Scikit-learn Decision Tree: 1.0000
```

PART 2: Ensemble Methods & Hyperparameter Tuning (Wine Dataset)

```
Decision Tree F1 Score: 0.9439974457215836
Random Forest F1 Score: 1.0
```

```
Best Parameters: {'max_depth': None, 'min_samples_split': 2, 'n_estimators': 100}
Best F1 Score: 0.9782952128219708
```

PART 3: Regression Models & Randomized Search CV

```
DT MSE: 0.16666666666666666
RF MSE: 0.06483333333333333
```

```
Best Parameters: {'n_estimators': 300, 'min_samples_split': 2, 'max_depth': 10}
```