

## decisionTree

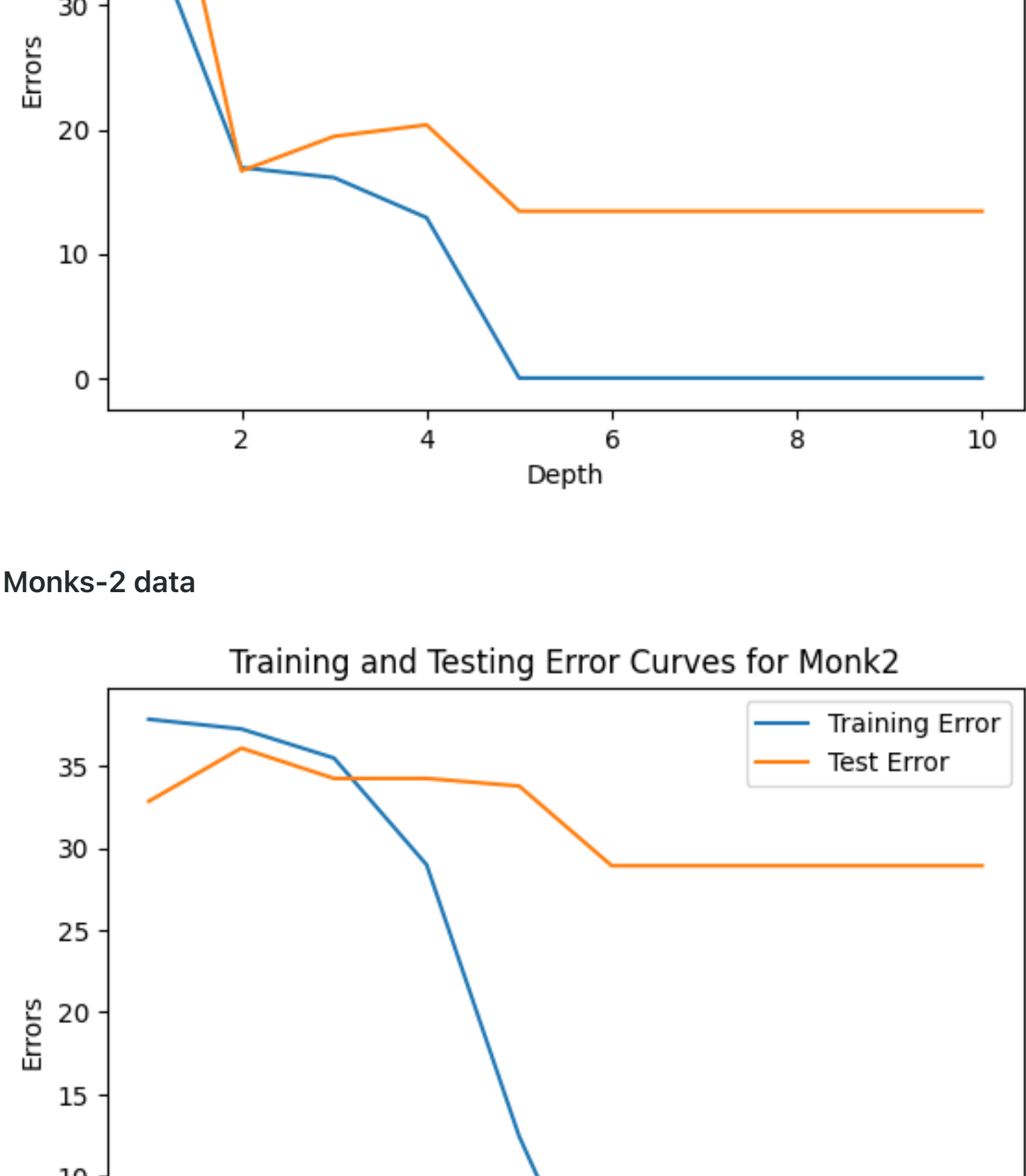
An implementation of the ID3 algorithm for decision trees.

### Answers to questions (by parts)

#### Part A

Plots of error vs tree depth

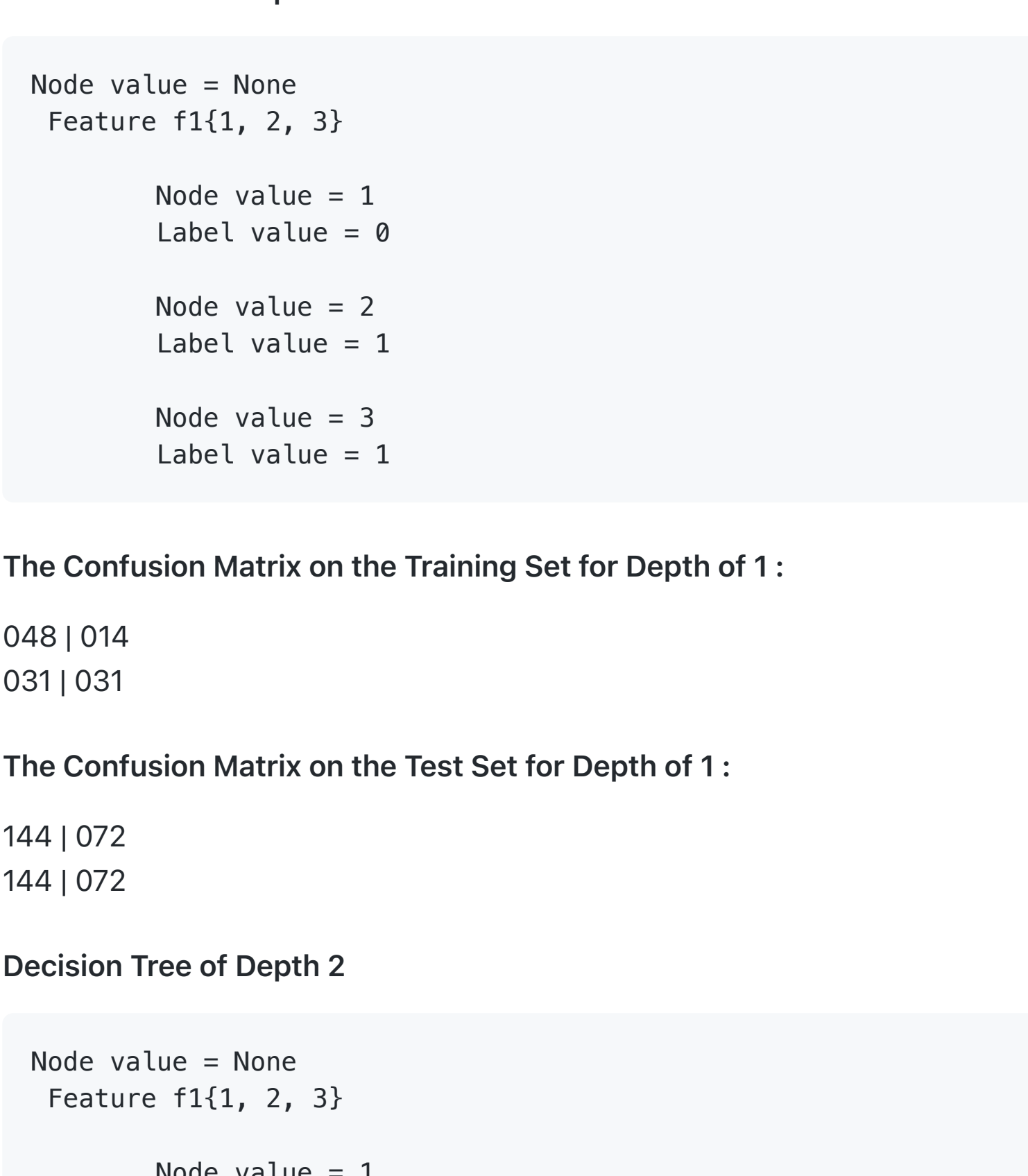
##### Monks-1 data



##### Monks-2 data



##### Monks-3 data



#### Part B

Learned Decision Tree and Confusion Matrices for depths 1 and 2 on Monks1 data.

##### Decision Tree of Depth 1

```
Node value = None
Feature f1{1, 2, 3}
```

```
Node value = 1
Label value = 0
```

```
Node value = 2
Label value = 1
```

```
Node value = 3
Label value = 1
```

The Confusion Matrix on the Training Set for Depth of 1 :

048 | 014

031 | 031

The Confusion Matrix on the Test Set for Depth of 1 :

144 | 072

144 | 072

##### Decision Tree of Depth 2

```
Node value = None
Feature f1{1, 2, 3}
```

```
Node value = 1
Feature f2{1, 2, 3}
```

```
Node value = 1
Label value = 1
```

```
Node value = 2
Label value = 0
```

```
Node value = 3
Label value = 0
```

```
Node value = 2
Feature f2{1, 2, 3}
```

```
Node value = 1
Label value = 0
```

```
Node value = 2
Label value = 1
```

```
Node value = 3
Label value = 0
```

```
Node value = 3
Feature f2{1, 2, 3}
```

```
Node value = 1
Label value = 0
```

```
Node value = 2
Label value = 0
```

```
Node value = 3
Label value = 1
```

The Confusion Matrix on the Training Set for Depth of 2 :

041 | 021

000 | 062

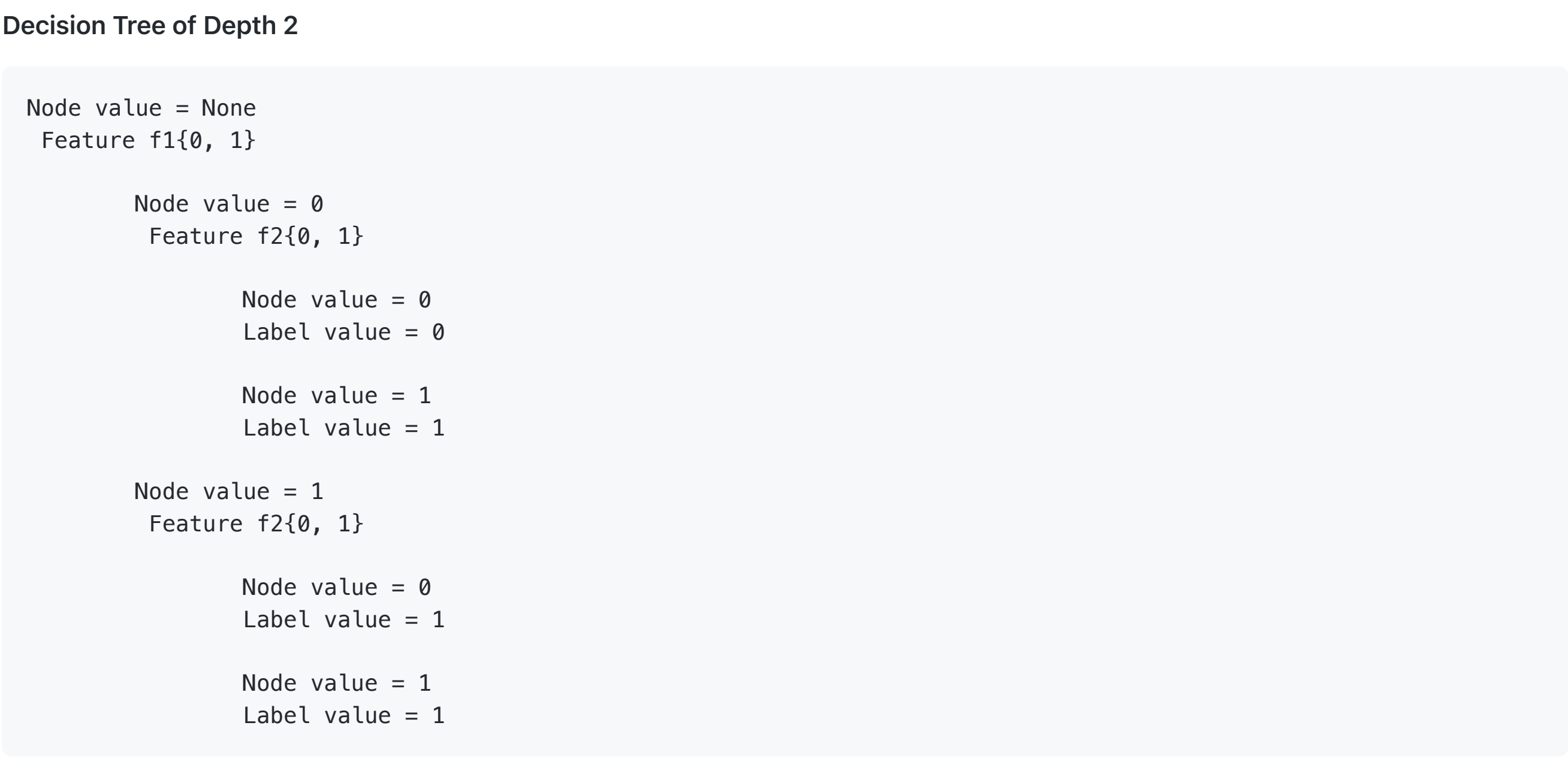
The Confusion Matrix on the Test Set for Depth of 2 :

144 | 072

000 | 216

#### Part C SciKit Learn's Decision tree for Monks1 data

##### Tree Generated by SciKit Learn on Monks data



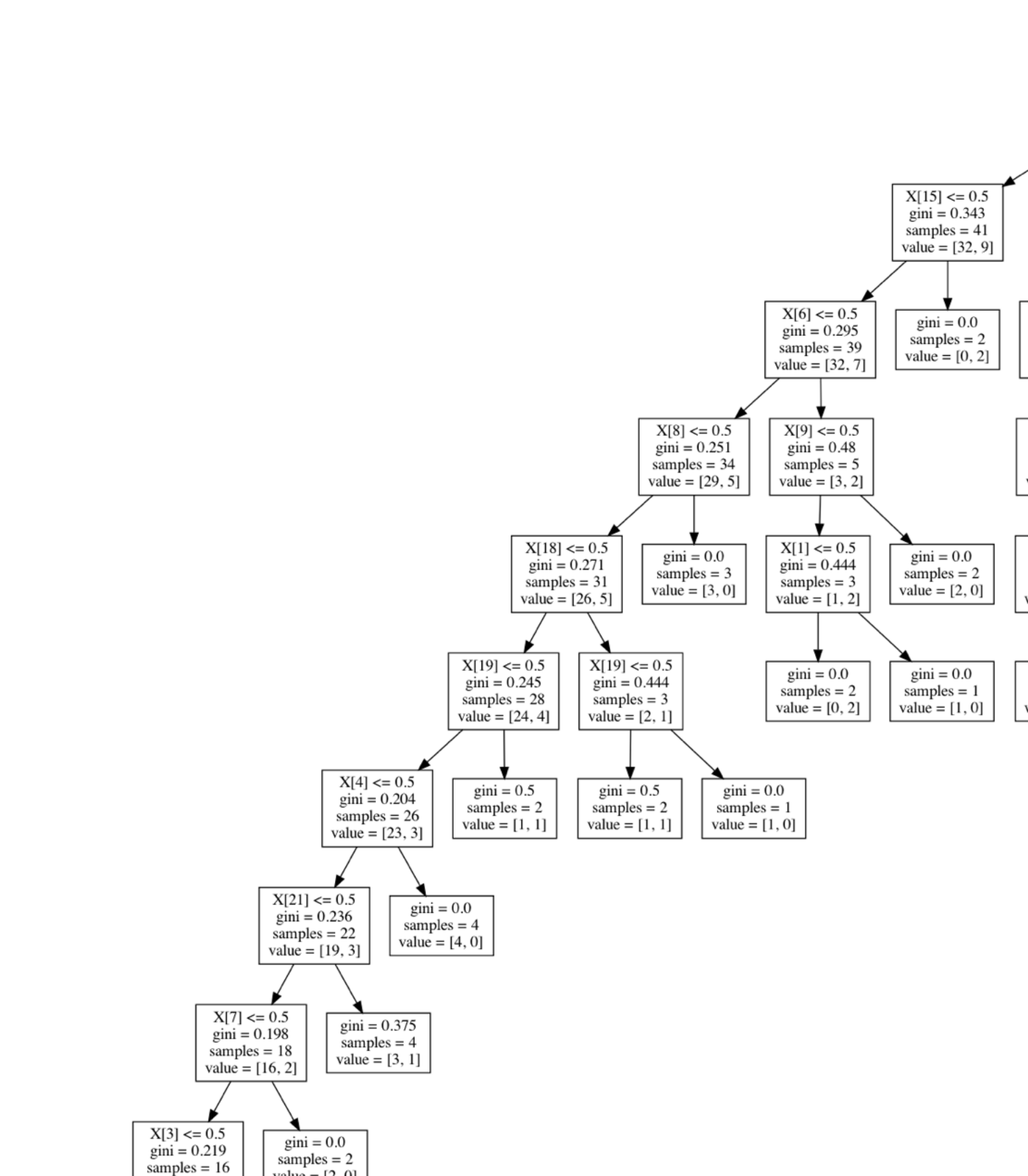
Confusion Matrix for Monks-1 Using Scikit:

200 | 016

036 | 180

#### Part D Custom decisionTree and SciKit Learn's Decision tree for SPECT data

##### Plot of error vs tree depth (decisionTree class)



##### Decision Tree of Depth 1

```
Node value = None
Feature f1{0, 1}
```

```
Node value = 0
Label value = 0
```

```
Node value = 1
Label value = 1
```

The Confusion Matrix on the Training Set for Depth of 1 :

018 | 022

011 | 029

The Confusion Matrix on the Test Set for Depth of 1 :

087 | 085

003 | 012

##### Decision Tree of Depth 2

```
Node value = None
Feature f1{0, 1}
```

```
Node value = 0
Feature f2{0, 1}
```

```
Node value = 0
Label value = 0
```

```
Node value = 1
Label value = 1
```

```
Node value = 1
Feature f2{0, 1}
```

```
Node value = 0
Label value = 1
```

```
Node value = 1
Label value = 1
```

The Confusion Matrix on the Training Set for Depth of 2 :

022 | 018

013 | 027

The Confusion Matrix on the Test Set for Depth of 2 :

105 | 067

003 | 012

##### Tree Generated by SciKit Learn on SPECT data



Scikit Learn on SPECT Data, Confusion Matrix:

118 | 054

003 | 012