In [5]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.metrics import accuracy_score
from sklearn.datasets import load_iris
from sklearn.model_selection import train_test_split
from sklearn.naive_bayes import GaussianNB
```

In [7]:
```
iris = load_iris()
```

In [11]:
```
data = pd.DataFrame(iris.data)
```

In [17]:
```
data
```

Out[17]:

	sepal length	sepal width	petal length	petal width	class
0	5.1	3.5	1.4	0.2	Iris-setosa
1	4.9	3.0	1.4	0.2	Iris-setosa
2	4.7	3.2	1.3	0.2	Iris-setosa
3	4.6	3.1	1.5	0.2	Iris-setosa
4	5.0	3.6	1.4	0.2	Iris-setosa
...	...	...	...	...	...
145	6.7	3.0	5.2	2.3	Iris-virginica
146	6.3	2.5	5.0	1.9	Iris-virginica
147	6.5	3.0	5.2	2.0	Iris-virginica
148	6.2	3.4	5.4	2.3	Iris-virginica
149	5.9	3.0	5.1	1.8	Iris-virginica

150 rows × 5 columns

In [19]:
```
data.isnull().sum()
```

Out[19]:
```
sepal length    0
sepal width     0
petal length    0
petal width     0
class           0
dtype: int64
```

In [21]:
```
X = iris.data
y = iris.target
```

In [25]:
```
X = data.drop(['class'], axis=1)
y = data.drop(['sepal length',  'sepal width',  'petal length',  'petal widt
print(X)
print(y)
print(X.shape)
print(y.shape)
```

```
     sepal length  sepal width  petal length  petal width
0             5.1          3.5           1.4          0.2
1             4.9          3.0           1.4          0.2
2             4.7          3.2           1.3          0.2
3             4.6          3.1           1.5          0.2
4             5.0          3.6           1.4          0.2
..            ...          ...           ...          ...
145           6.7          3.0           5.2          2.3
146           6.3          2.5           5.0          1.9
147           6.5          3.0           5.2          2.0
148           6.2          3.4           5.4          2.3
149           5.9          3.0           5.1          1.8

[150 rows x 4 columns]
              class
0       Iris-setosa
1       Iris-setosa
2       Iris-setosa
3       Iris-setosa
4       Iris-setosa
..              ...
145  Iris-virginica
146  Iris-virginica
147  Iris-virginica
148  Iris-virginica
149  Iris-virginica

[150 rows x 1 columns]
(150, 4)
(150, 1)
```

In [27]:
```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, shu
print(X_train.shape)
print(X_test.shape)
print(y_train.shape)
print(y_test.shape)
```

```
(120, 4)
(30, 4)
(120, 1)
(30, 1)
```

In [29]:
```
from sklearn.naive_bayes import GaussianNB
model = GaussianNB()
model.fit(X_train, y_train)
```

```
C:\Users\System21\anaconda3\Lib\site-packages\sklearn\utils\validation.py:
1184: DataConversionWarning: A column-vector y was passed when a 1d array
was expected. Please change the shape of y to (n_samples, ), for example u
sing ravel().
  y = column_or_1d(y, warn=True)
```

Out[29]:
```
GaussianNB

GaussianNB()
```

In [31]:
```
y_pred = model.predict(X_test)
model.score(X_test,y_test)
```

Out[31]:
```
1.0
```

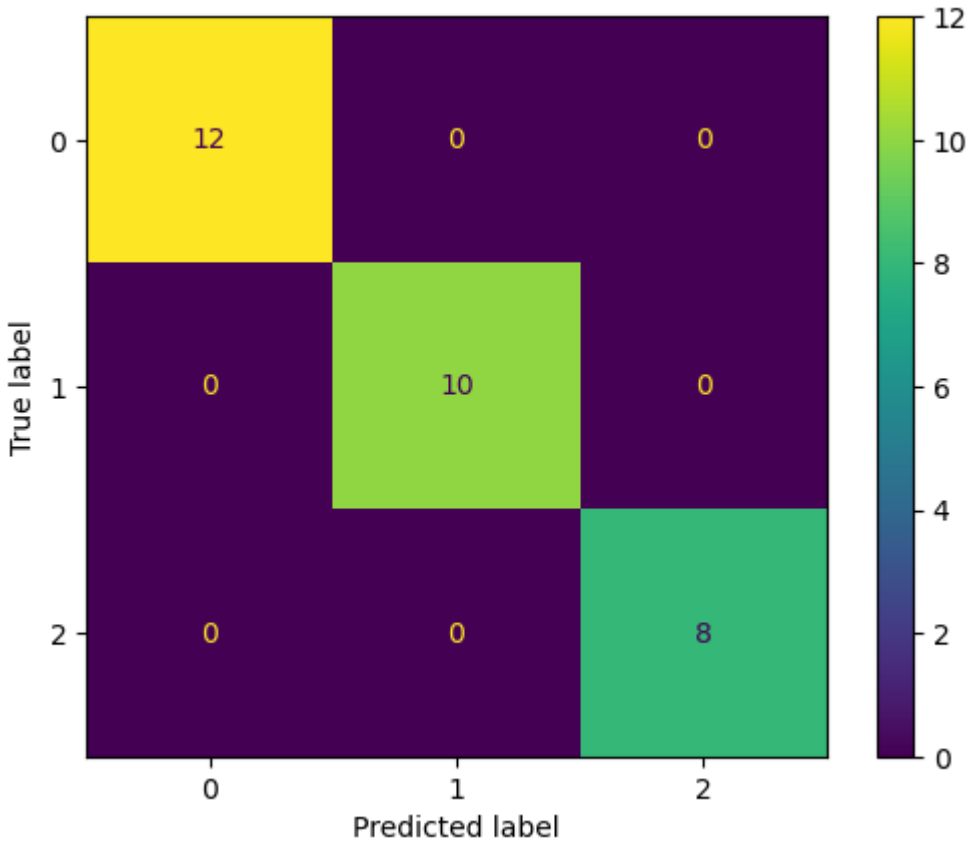
In [34]:
```
from sklearn.metrics import accuracy_score, confusion_matrix, ConfusionMatri
print(accuracy_score(y_test, y_pred))
```

```
1.0
```

In [36]:
```
cm = confusion_matrix(y_test, y_pred)
disp = ConfusionMatrixDisplay(confusion_matrix = cm)
print("Confusion matrix:")
print(cm)
```

```
Confusion matrix:
[[12  0  0]
 [ 0 10  0]
 [ 0  0  8]]
```

In [38]:
```
disp.plot()
plt.show()
```



In [40]:
```
def get_confusion_matrix_values(y_true, y_pred):
    cm = confusion_matrix(y_true, y_pred)
    return(cm[0][0], cm[0][1], cm[1][0], cm[1][1])

TP, FP, FN, TN = get_confusion_matrix_values(y_test, y_pred)
print("TP: ", TP)
print("FP: ", FP)
print("FN: ", FN)
print("TN: ", TN)
```

```
TP:  12
FP:  0
FN:  0
TN:  10
```

In [42]:
```
print("The Accuracy is ", (TP+TN)/(TP+TN+FP+FN))
print("The precision is ", TP/(TP+FP))
print("Error Rate:",1-(TP+TN)/(TP+TN+FP+FN))
print("The recall is ", TP/(TP+FN))
```

```
The Accuracy is  1.0
The precision is  1.0
error rate: 0.0
The recall is  1.0
```