IMPORT LIBRARIES

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.datasets import load_breast_cancer
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import confusion_matrix, classification_report, roc_curve,
```

LOAD DATASET

In [2]:
```
data = load_breast_cancer()
X = pd.DataFrame(data.data, columns=data.feature_names)
y = pd.Series(data.target)
```

In [ ]:
```
SPLIT DATA AND STANDARDIZE FEATURES
```

In [3]:
```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_
scaler = StandardScaler()
X_train_scaled = scaler.fit_transform(X_train)
X_test_scaled = scaler.transform(X_test)
```

In [4]:
```
# Fit a logistic regression model
model = LogisticRegression()
model.fit(X_train_scaled, y_train)
```

Out[4]:
```
LogisticRegression()
```

In [5]:
```
#Model Evaluation
y_pred = model.predict(X_test_scaled)
y_proba = model.predict_proba(X_test_scaled)[:, 1]
```

In [6]:
```
# Confusion Matrix
conf_mat = confusion_matrix(y_test, y_pred)
print("Confusion Matrix:\n", conf_mat)
```

```
Confusion Matrix:
 [[41  2]
 [ 1 70]]
```

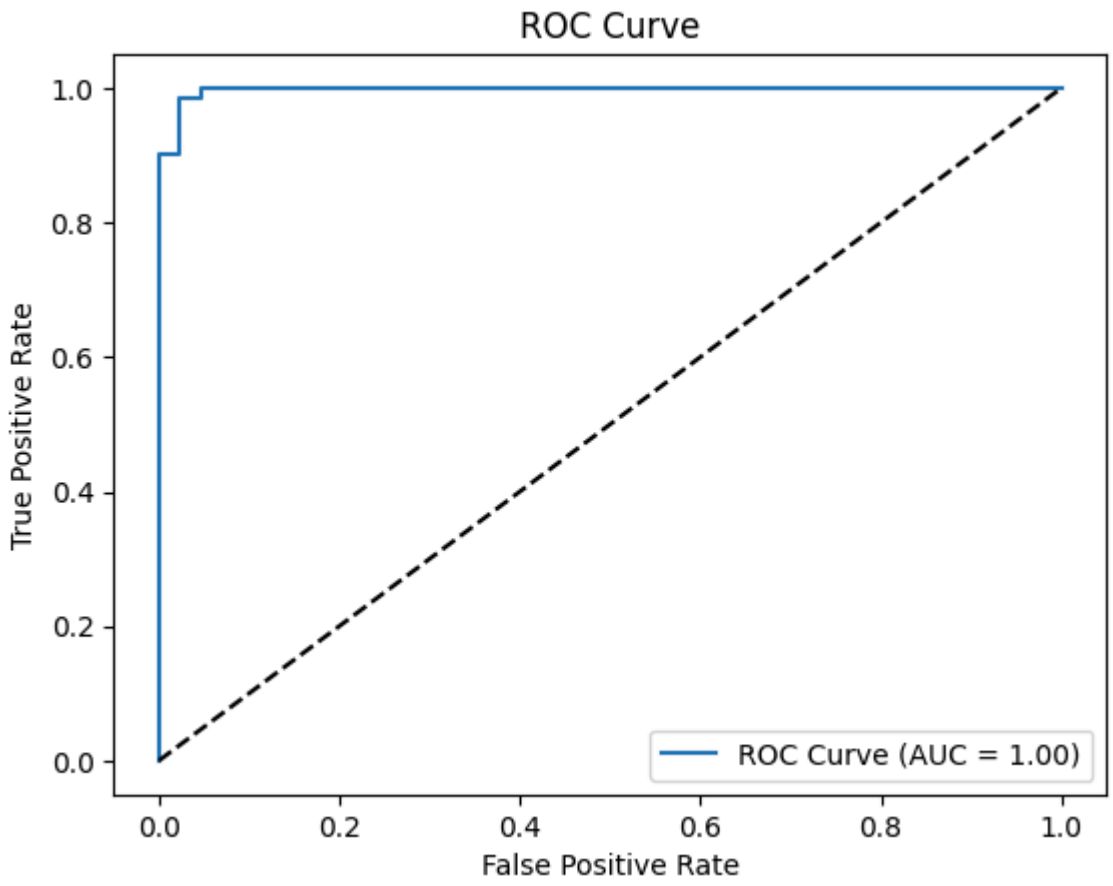
In [7]:
```
print("\nClassification Report:\n", classification_report(y_test, y_pred))
```

```
Classification Report:
              precision    recall  f1-score   support

           0       0.98      0.95      0.96        43
           1       0.97      0.99      0.98        71

    accuracy                           0.97       114
   macro avg       0.97      0.97      0.97       114
weighted avg       0.97      0.97      0.97       114
```

In [8]:
```
# ROC-AUC Score
roc_auc = roc_auc_score(y_test, y_proba)
print("ROC-AUC Score:", roc_auc)
```

```
ROC-AUC Score: 0.99737962659679
```

In [9]:
```
# ROC Curve
fpr, tpr, thresholds = roc_curve(y_test, y_proba)
plt.plot(fpr, tpr, label=f'ROC Curve (AUC = {roc_auc:.2f})')
plt.plot([0, 1], [0, 1], 'k--')
plt.xlabel('False Positive Rate')
plt.ylabel('True Positive Rate')
plt.title('ROC Curve')
plt.legend()
plt.show()
```

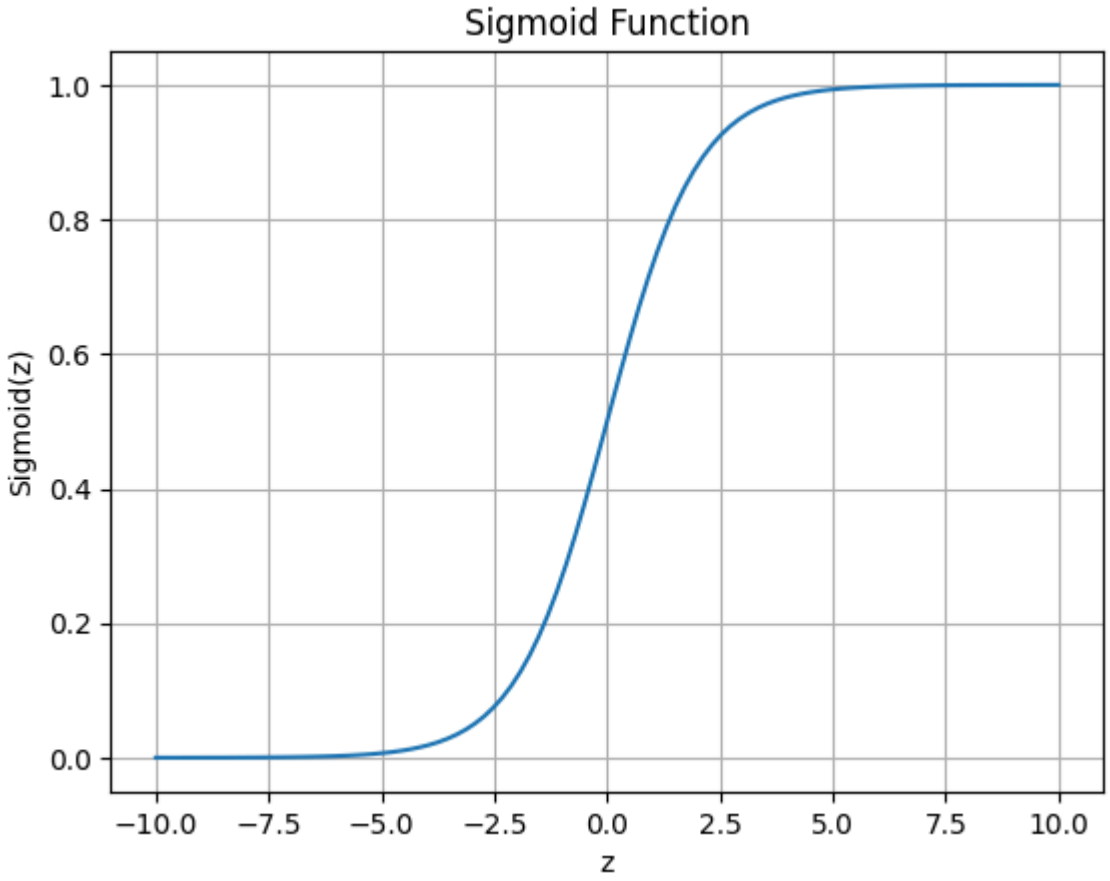


In [10]:
```
# Tune the threshold
threshold = 0.3
y_pred_thresh = (y_proba >= threshold).astype(int)
print("\nConfusion Matrix at threshold 0.3:\n", confusion_matrix(y_test, y_pred_
```

```
Confusion Matrix at threshold 0.3:
 [[41  2]
 [ 0 71]]
```

In [11]:
```
# Sigmoid function
def sigmoid(z):
    return 1 / (1 + np.exp(-z))

z = np.linspace(-10, 10, 100)
sig = sigmoid(z)
plt.plot(z, sig)
plt.title("Sigmoid Function")
```

```
plt.xlabel("z")
plt.ylabel("Sigmoid(z)")
plt.grid(True)
plt.show()
```



In [ ]: