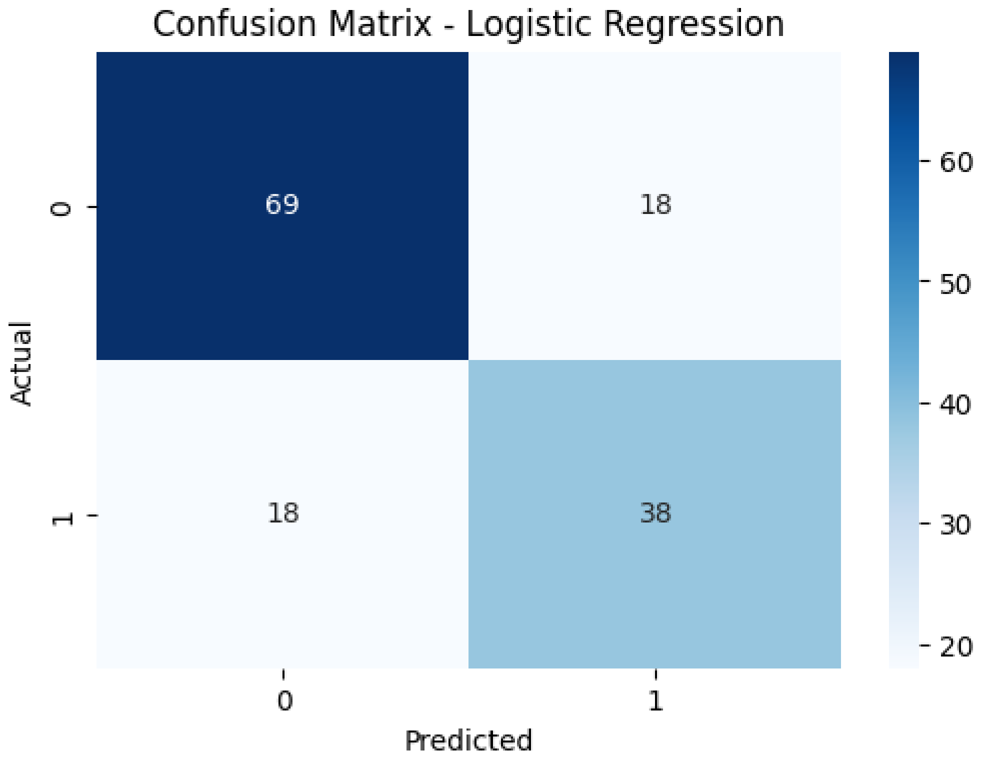
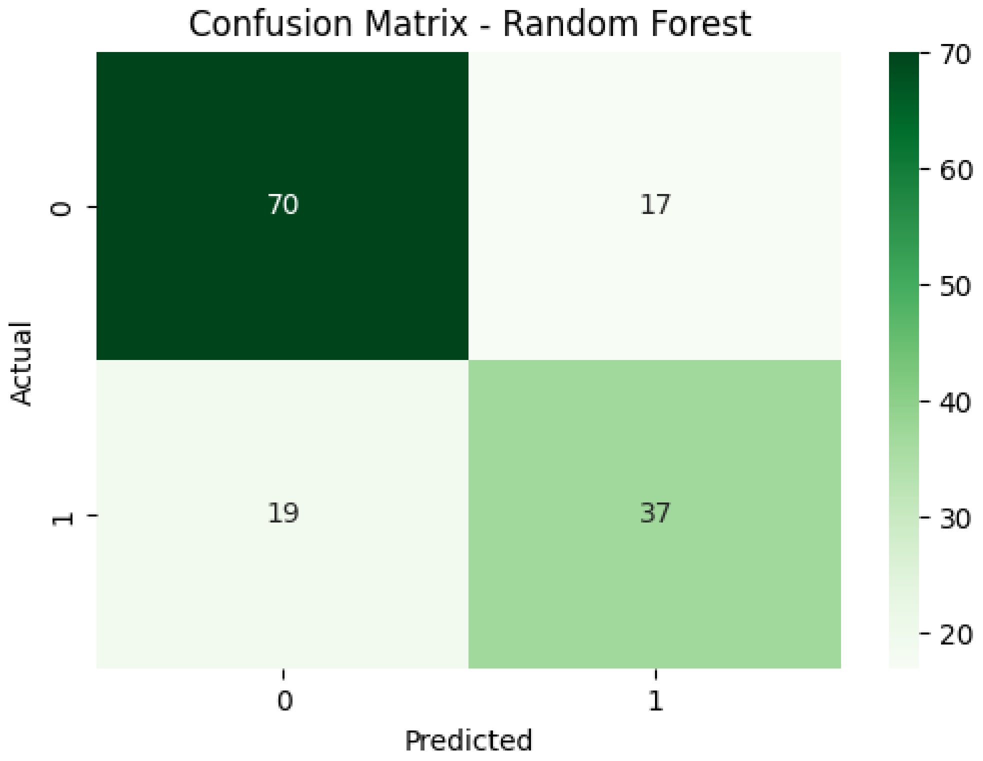
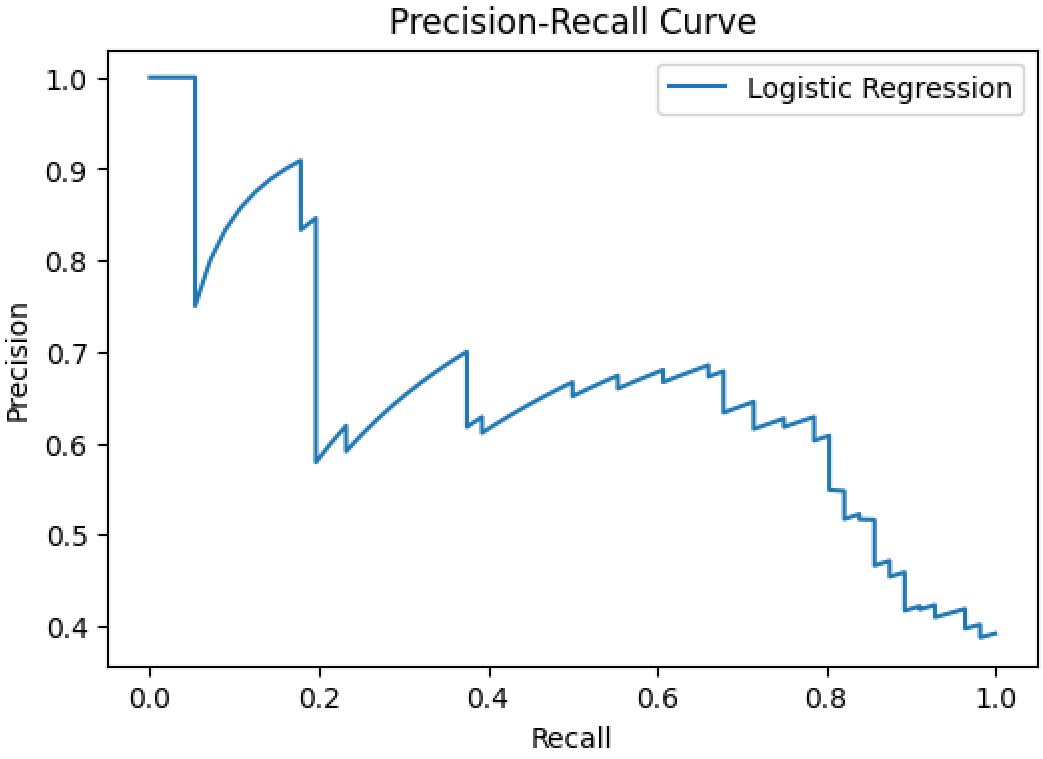
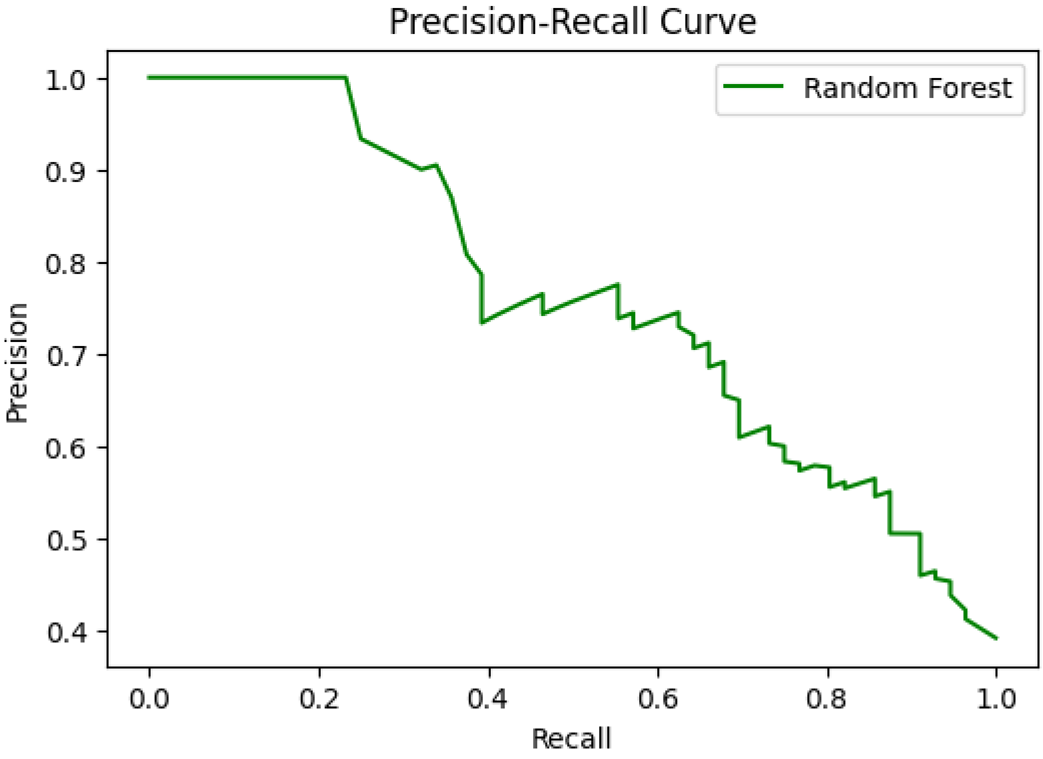
In [1]:

```
# Import Libraries
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import os
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import (
    confusion_matrix,
    classification_report,
    precision_recall_curve,
    accuracy_score,
    f1_score
)

# Load Dataset (Titanic)
df = sns.load_dataset('titanic')

# Preprocess
df = df[['sex', 'age', 'fare', 'survived']].dropna()
df['sex'] = df['sex'].map({'male': 0, 'female': 1})

X = df[['sex', 'age', 'fare']]
y = df['survived']

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_sta

# Train Logistic Regression Model
lr = LogisticRegression()
lr.fit(X_train, y_train)
y_pred_lr = lr.predict(X_test)

# Train Random Forest Model
rf = RandomForestClassifier()
rf.fit(X_train, y_train)
y_pred_rf = rf.predict(X_test)

# Create Results Directory
if not os.path.exists('results'):
    os.makedirs('results')

# Confusion Matrix for Logistic Regression
cm_lr = confusion_matrix(y_test, y_pred_lr)
plt.figure(figsize=(6, 4))
sns.heatmap(cm_lr, annot=True, fmt='d', cmap='Blues')
plt.title('Confusion Matrix - Logistic Regression')
plt.xlabel('Predicted')
plt.ylabel('Actual')
plt.savefig('results/confusion_matrix_lr.png')
plt.show()

# Confusion Matrix for Random Forest
cm_rf = confusion_matrix(y_test, y_pred_rf)
plt.figure(figsize=(6, 4))
sns.heatmap(cm_rf, annot=True, fmt='d', cmap='Greens')
plt.title('Confusion Matrix - Random Forest')
plt.xlabel('Predicted')
plt.ylabel('Actual')
plt.savefig('results/confusion_matrix_rf.png')
plt.show()

# Precision-Recall Curve for Logistic Regression
y_scores_lr = lr.predict_proba(X_test)[:, 1]
precision_lr, recall_lr, _ = precision_recall_curve(y_test, y_scores_lr)
plt.figure(figsize=(6, 4))
plt.plot(recall_lr, precision_lr, label='Logistic Regression')
plt.xlabel('Recall')
plt.ylabel('Precision')
plt.title('Precision-Recall Curve')
plt.legend()
plt.savefig('results/precision_recall_curve_lr.png')
plt.show()

# Precision-Recall Curve for Random Forest
y_scores_rf = rf.predict_proba(X_test)[:, 1]
precision_rf, recall_rf, _ = precision_recall_curve(y_test, y_scores_rf)
plt.figure(figsize=(6, 4))
plt.plot(recall_rf, precision_rf, label='Random Forest', color='green')
plt.xlabel('Recall')
plt.ylabel('Precision')
plt.title('Precision-Recall Curve')
plt.legend()
plt.savefig('results/precision_recall_curve_rf.png')
plt.show()

# Model Comparison - Print Classification Reports
print("Logistic Regression Report:\n", classification_report(y_test, y_pred_lr))
print("\nRandom Forest Report:\n", classification_report(y_test, y_pred_rf))

# Calculate Accuracy and F1-Score
accuracy_lr = accuracy_score(y_test, y_pred_lr)
accuracy_rf = accuracy_score(y_test, y_pred_rf)

f1_lr = f1_score(y_test, y_pred_lr)
f1_rf = f1_score(y_test, y_pred_rf)

print(f"Logistic Regression - Accuracy: {accuracy_lr:.4f}, F1-Score: {f1_lr:.4f}")
print(f"Random Forest - Accuracy: {accuracy_rf:.4f}, F1-Score: {f1_rf:.4f}")

# Decide and Print Better Model
if f1_rf > f1_lr:
    print("\n➡️ Random Forest is better because it has a higher F1-Score, meaning 
elif f1_rf < f1_lr:
    print("\n➡️ Logistic Regression is better because it has a higher F1-Score, mea
else:
    print("\n➡️ Both models perform similarly based on F1-Score.")
```


Confusion Matrix - Logistic Regression
Actual
Predicted
0
1
0
1
69
18
18
38
60
50
40
30
20


Confusion Matrix - Random Forest
Actual
Predicted
0
1
0
1
70
17
19
37
70
60
50
40
30
20


Precision-Recall Curve
Logistic Regression
Precision
Recall
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.0
0.2
0.4
0.6
0.8
1.0


Precision-Recall Curve
Random Forest
Precision
Recall
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.0
0.2
0.4
0.6
0.8
1.0

```
Logistic Regression Report:
              precision    recall  f1-score   support

           0       0.79      0.79      0.79        87
           1       0.68      0.68      0.68        56

    accuracy                           0.75       143
   macro avg       0.74      0.74      0.74       143
weighted avg       0.75      0.75      0.75       143


Random Forest Report:
              precision    recall  f1-score   support

           0       0.79      0.80      0.80        87
           1       0.69      0.66      0.67        56

    accuracy                           0.75       143
   macro avg       0.74      0.73      0.73       143
weighted avg       0.75      0.75      0.75       143

Logistic Regression - Accuracy: 0.7483, F1-Score: 0.6786
Random Forest - Accuracy: 0.7483, F1-Score: 0.6727

➡️ Logistic Regression is better because it has a higher F1-Score, meaning it bala
nces precision and recall more effectively.
```