In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

import os
import warnings
warnings.filterwarnings('ignore')

from sklearn.linear_model import LogisticRegression
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score , confusion_matrix , classifica
from sklearn.preprocessing import StandardScaler
```

In [2]:
```
df = pd.read_csv('creditcard.csv')
df
```

Out[2]:

	Time	V1	V2	V3	V4	V5	V6	V7	
0	0.0	-1.359807	-0.072781	2.536347	1.378155	-0.338321	0.462388	0.239599	0
1	0.0	1.191857	0.266151	0.166480	0.448154	0.060018	-0.082361	-0.078803	0
2	1.0	-1.358354	-1.340163	1.773209	0.379780	-0.503198	1.800499	0.791461	0
3	1.0	-0.966272	-0.185226	1.792993	-0.863291	-0.010309	1.247203	0.237609	0
4	2.0	-1.158233	0.877737	1.548718	0.403034	-0.407193	0.095921	0.592941	-0
...	...	...	...	...	...	...	...	...	
284802	172786.0	-11.881118	10.071785	-9.834783	-2.066656	-5.364473	-2.606837	-4.918215	7
284803	172787.0	-0.732789	-0.055080	2.035030	-0.738589	0.868229	1.058415	0.024330	0
284804	172788.0	1.919565	-0.301254	-3.249640	-0.557828	2.630515	3.031260	-0.296827	0
284805	172788.0	-0.240440	0.530483	0.702510	0.689799	-0.377961	0.623708	-0.686180	0
284806	172792.0	-0.533413	-0.189733	0.703337	-0.506271	-0.012546	-0.649617	1.577006	-0

284807 rows × 31 columns

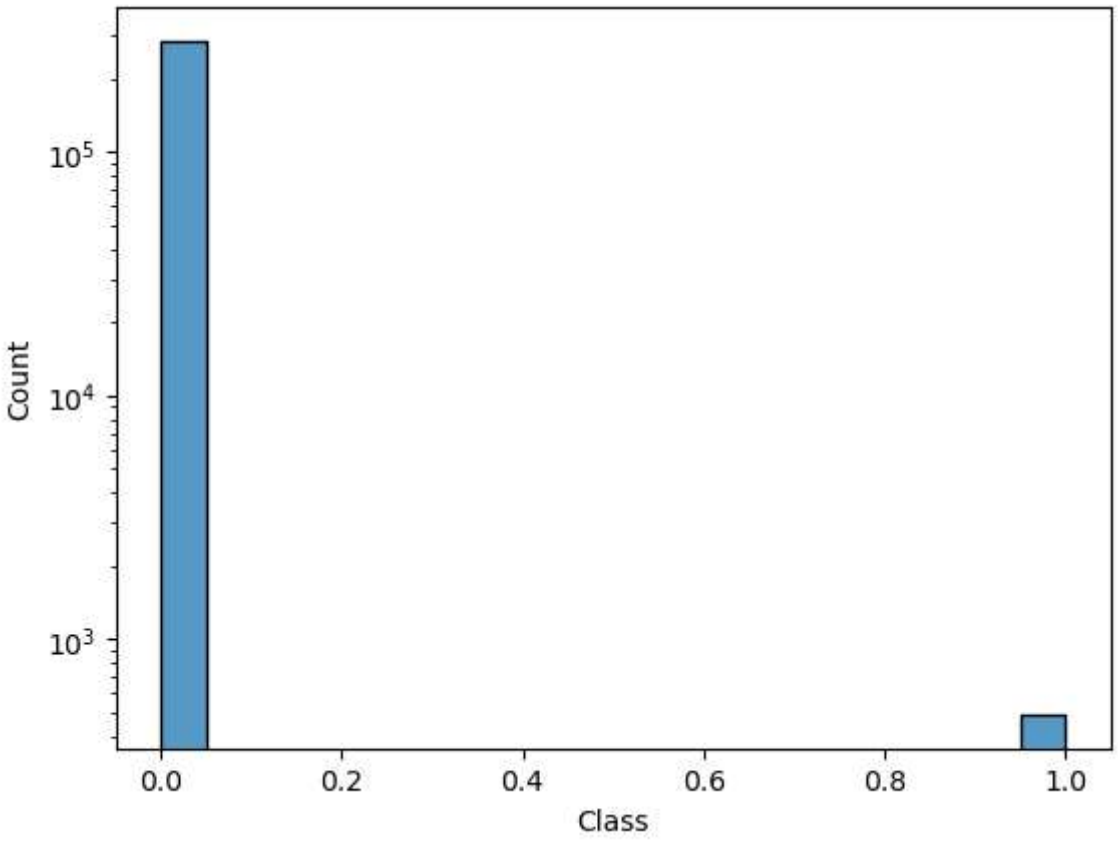
In [3]:
```
1 df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 284807 entries, 0 to 284806
Data columns (total 31 columns):
 #   Column  Non-Null Count   Dtype  
---  ------  --------------   -----  
 0   Time    284807 non-null  float64
 1   V1      284807 non-null  float64
 2   V2      284807 non-null  float64
 3   V3      284807 non-null  float64
 4   V4      284807 non-null  float64
 5   V5      284807 non-null  float64
 6   V6      284807 non-null  float64
 7   V7      284807 non-null  float64
 8   V8      284807 non-null  float64
 9   V9      284807 non-null  float64
 10  V10     284807 non-null  float64
 11  V11     284807 non-null  float64
 12  V12     284807 non-null  float64
 13  V13     284807 non-null  float64
 14  V14     284807 non-null  float64
 15  V15     284807 non-null  float64
 16  V16     284807 non-null  float64
 17  V17     284807 non-null  float64
 18  V18     284807 non-null  float64
 19  V19     284807 non-null  float64
 20  V20     284807 non-null  float64
 21  V21     284807 non-null  float64
 22  V22     284807 non-null  float64
 23  V23     284807 non-null  float64
 24  V24     284807 non-null  float64
 25  V25     284807 non-null  float64
 26  V26     284807 non-null  float64
 27  V27     284807 non-null  float64
 28  V28     284807 non-null  float64
 29  Amount  284807 non-null  float64
 30  Class   284807 non-null  int64  
dtypes: float64(30), int64(1)
memory usage: 67.4 MB
```

In [4]:
```
1 df['Class'].value_counts()
```

Out[4]:
```
0    284315
1       492
Name: Class, dtype: int64
```

In [5]:
```
1 sns.histplot(df['Class'])
2 plt.yscale('log')
3 plt.show()
```



In [6]:
```
1 df.groupby('Class')['Amount'].sum()
```

Out[6]:
```
Class
0    25102462.04
1       60127.97
Name: Amount, dtype: float64
```

In [7]:
```
1 x = df[0:-1]
2 y = df['Class']
```

In [8]:
```
1 x_dummy=df.drop(columns='Class', axis=1)
2 scaler=StandardScaler()
3 x=scaler.fit_transform(x_dummy)
```

In [9]:
```
1 x_train , x_test , y_train , y_test = train_test_split(x,y,test_size = 0.
```

In [10]:
```
logit = LogisticRegression()
logit.fit(x_train,y_train)
```

Out[10]:
```
LogisticRegression
LogisticRegression()
```

In [11]:
```
y_pred_train = logit.predict(x_train)
y_pred_test = logit.predict(x_test)
```

In [12]:
```
print(accuracy_score(y_train,y_pred_train))
print(accuracy_score(y_test,y_pred_test))
```

```
0.9991760492497834
0.9991854161399961
```

In [15]:
```
print(classification_report(y_train, y_pred_train))
```

```
              precision    recall  f1-score   support

           0       1.00      1.00      1.00    213238
           1       0.87      0.61      0.72       367

    accuracy                           1.00    213605
   macro avg       0.93      0.81      0.86    213605
weighted avg       1.00      1.00      1.00    213605
```

In [16]:
```
print(classification_report(y_test, y_pred_test))
```

```
              precision    recall  f1-score   support

           0       1.00      1.00      1.00     71077
           1       0.89      0.61      0.72       125

    accuracy                           1.00     71202
   macro avg       0.95      0.80      0.86     71202
weighted avg       1.00      1.00      1.00     71202
```

In [17]:
```
print( confusion_matrix(y_train, y_pred_train))
print("**********"*3)
print(confusion_matrix(y_test, y_pred_test))
```

```
[[213204     34]
 [   142    225]]
******************************
[[71068     9]
 [   49    76]]
```

In [18]:
```
from sklearn.metrics import roc_auc_score
logit_roc_auc = roc_auc_score(y_test, y_pred_test)
logit_roc_auc
```

Out[18]: 0.8039366883802074

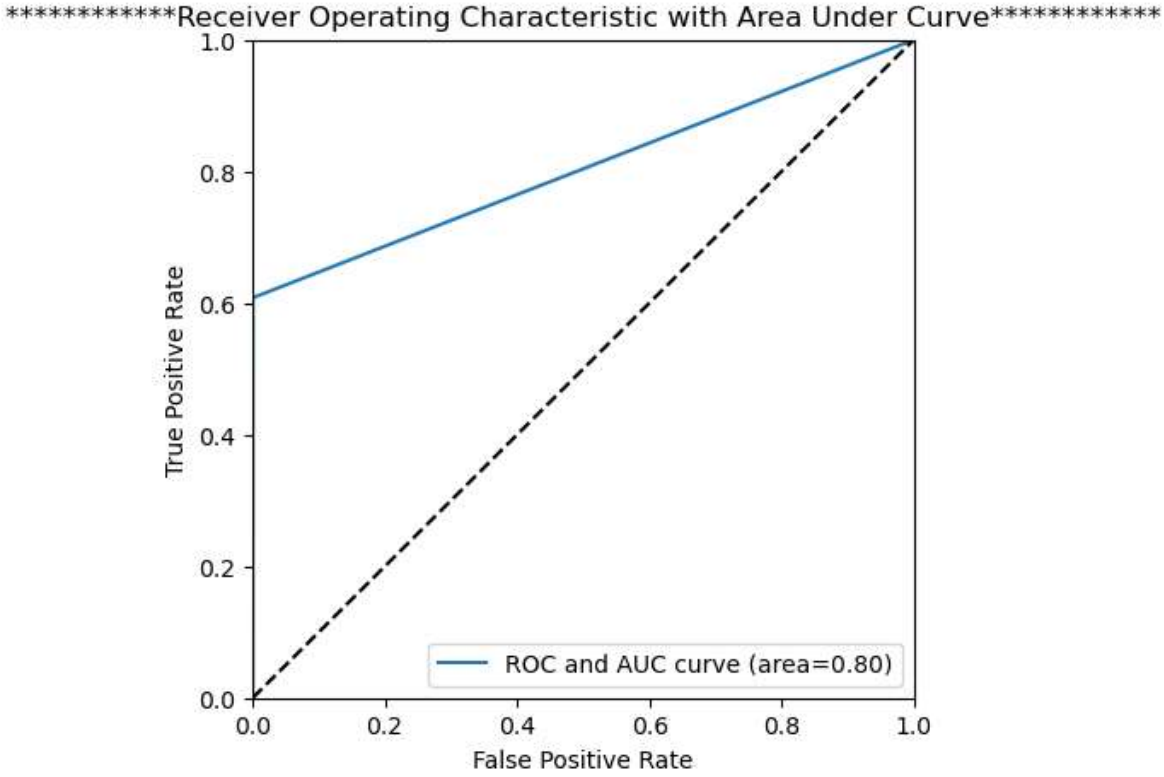
In [19]:
```
from sklearn.metrics import roc_curve
fpr, tpr, thresholds = roc_curve(y_test, y_pred_test)
display(fpr[:10])
display(tpr[:10])
display(thresholds[:10])
```

```
array([0.0000000e+00, 1.2662324e-04, 1.0000000e+00])

array([0.   , 0.608, 1.   ])

array([2, 1, 0], dtype=int64)
```

In [26]:
```
plt.figure(figsize=(5,5))
plt.plot(fpr, tpr, label="ROC and AUC curve (area=%0.2f)" % logit_roc_auc)
plt.plot([0,1],[0,1], 'k--')
plt.xlim([0.0,1.0])
plt.ylim([0.0,1.0])
plt.xlabel('False Positive Rate')
plt.ylabel('True Positive Rate')
plt.title("************Receiver Operating Characteristic with Area Under C
plt.legend(loc='lower right')
plt.show()
```



In [27]:
```
# Cross Validation approach - K-Fold Method
from sklearn.model_selection import cross_val_score
training_accuracy = cross_val_score(logit, x_train, y_train, cv=10)
test_accuracy = cross_val_score(logit, x_test, y_test, cv=10)
print(training_accuracy)
print()
print(test_accuracy)
print()
print("Training Avg Accuracy", training_accuracy.mean())
print()
print("Test Avg Accuracy", test_accuracy.mean())
```

```
[0.99929779 0.99925097 0.99897009 0.99911053 0.99906371 0.9991573
 0.99920412 0.99878277 0.99901685 0.99934457]

[0.99915742 0.99943828 0.99985955 0.99929775 0.9997191  0.9994382
 0.99901685 0.9988764  0.99957865 0.9991573 ]

Training Avg Accuracy 0.9991198703507231

Test Avg Accuracy 0.9993539523075443
```

In [ ]:
```

```