In [38]:

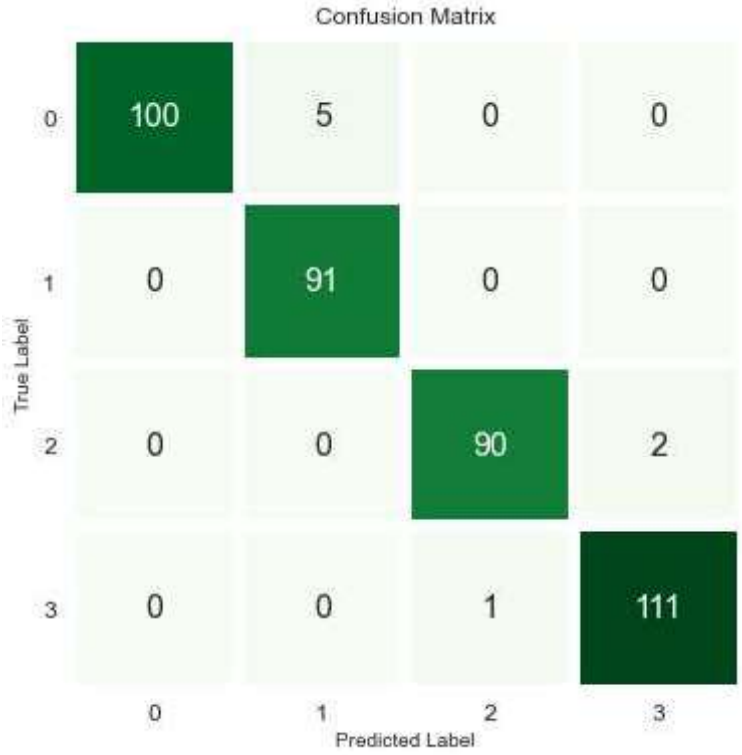
```
classifier = LogisticRegression(C=545.5594781168514, random_state=42)

classifier.fit(X_train,y_train)

y_pred = classifier.predict(X_test)

print(classification_report(y_test, y_pred))
```

```
              precision    recall  f1-score   support

           0       1.00      0.95      0.98       105
           1       0.95      1.00      0.97        91
           2       0.99      0.98      0.98        92
           3       0.98      0.99      0.99       112

    accuracy                           0.98       400
   macro avg       0.98      0.98      0.98       400
weighted avg       0.98      0.98      0.98       400
```

Confusion Matrix

In [39]:

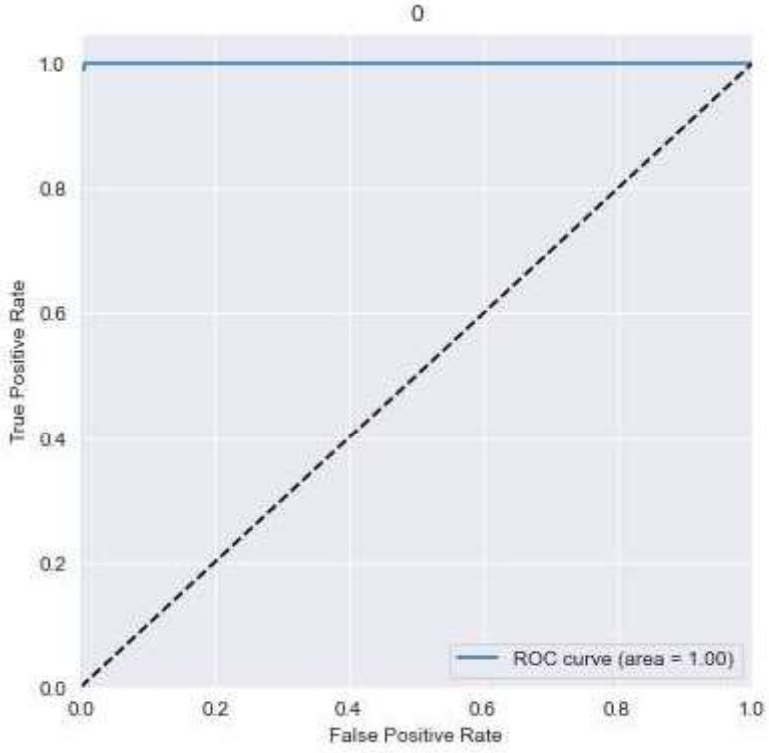
```
cm = confusion_matrix(y_test, y_pred)

df1 = pd.DataFrame(columns=["0","1","2","3"], index= ["0","1","2","3"], data= cm )

f,ax = plt.subplots(figsize=(6,6))

sns.heatmap(df1, annot=True,cmap="Greens", fmt= '.0f',ax=ax,linewidths = 5, cbar = Fals
plt.xlabel("Predicted Label")
plt.xticks(size = 12)
plt.yticks(size = 12, rotation = 0)
plt.ylabel("True Label")
plt.title("Confusion Matrix", size = 12)
plt.show()
```

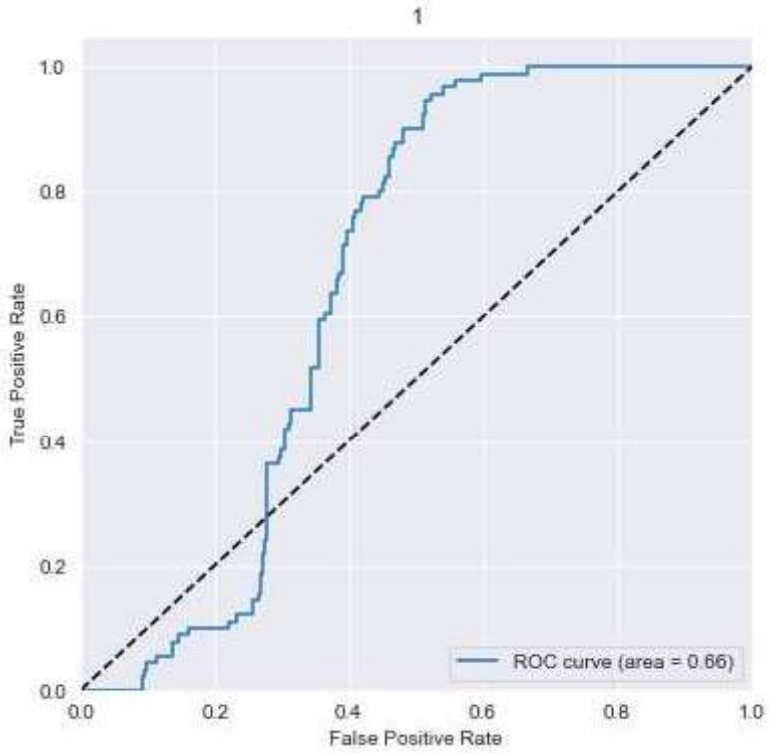


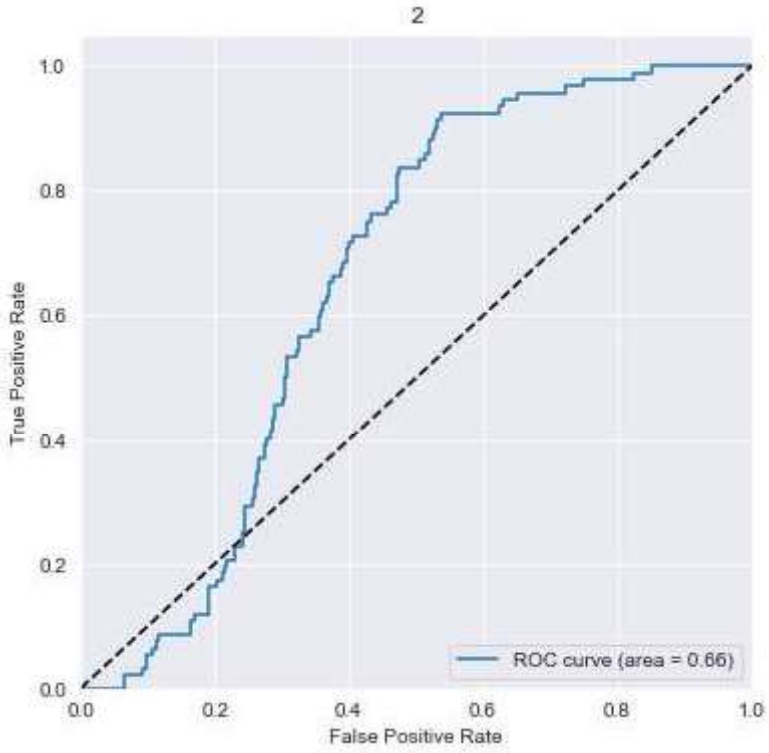
Positive Rates

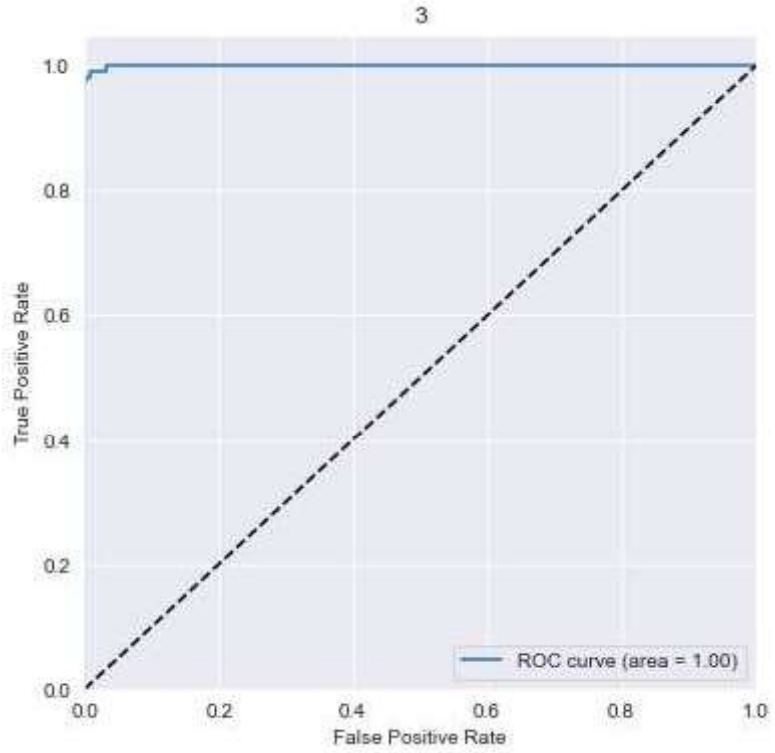
In [40]:

```
X = df.iloc[:,0:20].values
y = df.iloc[:, 20].values

y = label_binarize(y, classes=[0,1,2,3])
n_classes = 4

X_train, X_test, y_train, y_test =\
    train_test_split(X, y, test_size=0.2, random_state=42)

sc = StandardScaler()

X_train = sc.fit_transform(X_train)
X_test = sc.transform(X_test)

clf = OneVsRestClassifier(best_estimators[3])
y_score = clf.fit(X_train, y_train).decision_function(X_test)

fpr = dict()
tpr = dict()
roc_auc = dict()

for i in range(n_classes):
    fpr[i], tpr[i], _ = roc_curve(y_test[:, i],
                                  y_score[:, i])
    roc_auc[i] = auc(fpr[i],
                     tpr[i])

for i in range(n_classes):
    plt.figure(figsize = (6,6))
    plt.plot(fpr[i], tpr[i], label='ROC curve (area = %0.2f)' % roc_auc[i])
    plt.plot([0, 1], [0, 1], 'k--')
    plt.xlim([0.0, 1.0])
    plt.ylim([0.0, 1.05])
    plt.xlabel('False Positive Rate')
    plt.ylabel('True Positive Rate')
    plt.title(i)
    plt.legend(loc="lower right")
    plt.show()
```


0
True Positive Rate
False Positive Rate
ROC curve (area = 1.00)
0.0
0.2
0.4
0.6
0.8
1.0


1
True Positive Rate
False Positive Rate
ROC curve (area = 0.66)
0.0
0.2
0.4
0.6
0.8
1.0


2
True Positive Rate
False Positive Rate
ROC curve (area = 0.66)
0.0
0.2
0.4
0.6
0.8
1.0



Test.csv

In [41]:

```
1 dft= pd.read_csv('test.csv')
2 dft.head()
```

Out[41]:

	id	battery_power	blue	clock_speed	dual_sim	fc	four_g	int_memory	m_dep	mobile_wt
0	1	1043	1	1.8	1	14	0	5	0.1	193
1	2	841	1	0.5	1	4	1	61	0.8	191
2	3	1807	1	2.8	0	1	0	27	0.9	186
3	4	1546	0	0.5	1	18	1	25	0.5	96
4	5	1434	0	1.4	0	11	1	49	0.5	108

5 rows × 21 columns