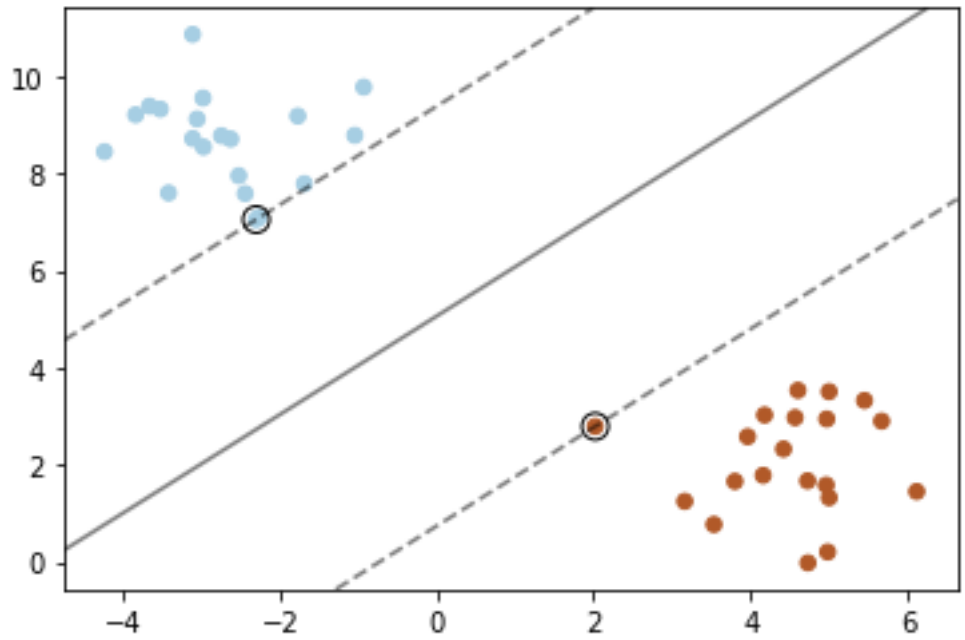
Q1:How many support vectors are there for each class in your example?

There are two support vectors.

What is the shape of the decision boundary?

The shape of the decision boundary linear.

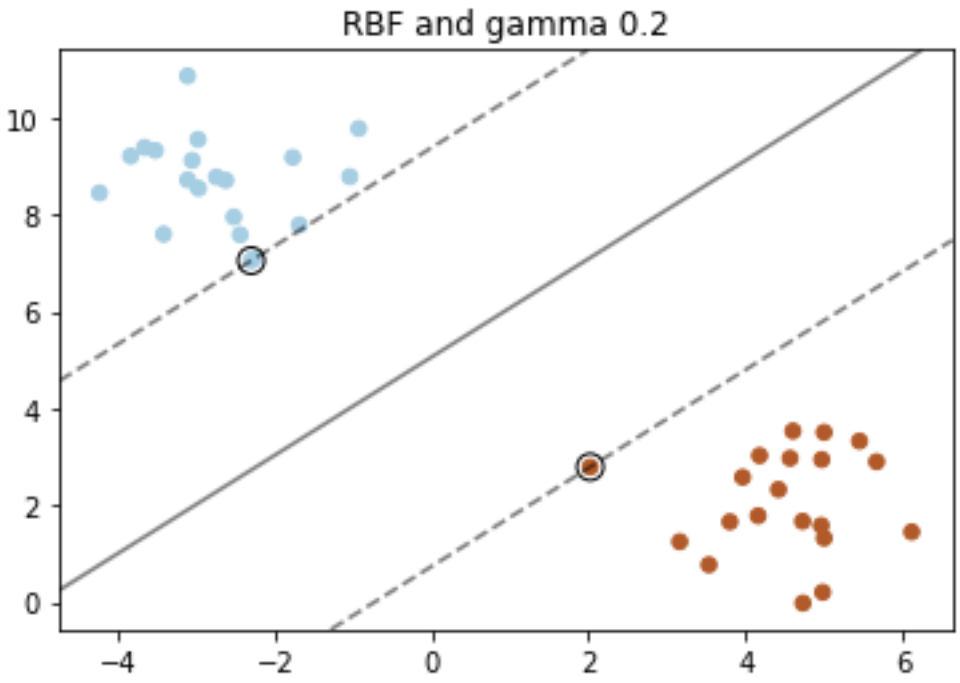


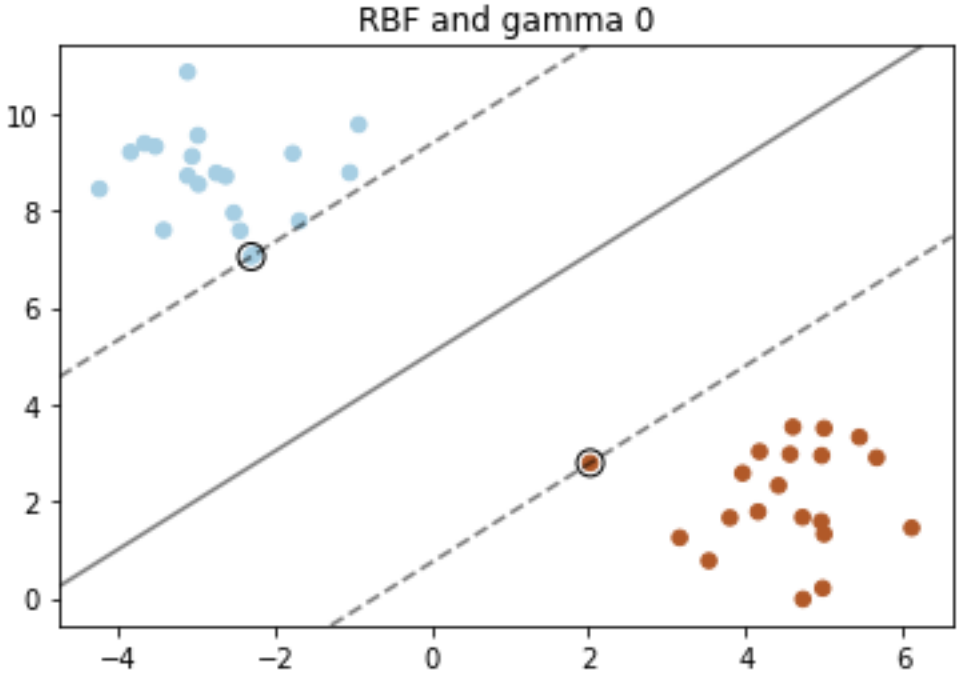
1.How many support vectors are there for each class for each value of ` gamma

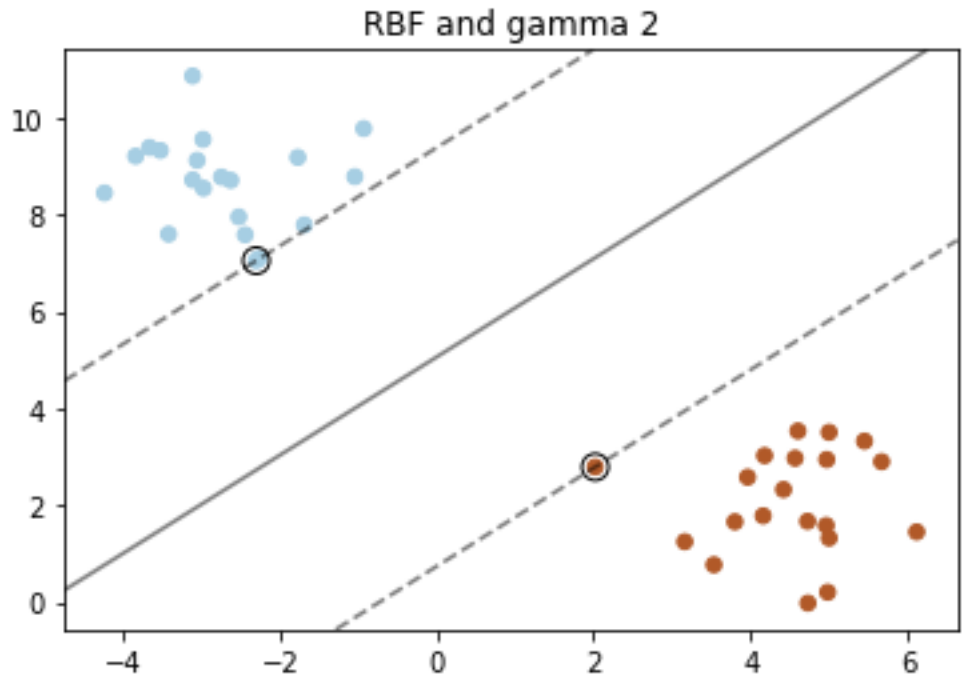
Two support vectors in all gamma values

2.What is the shape of the decision boundary for each value of `gamma`?

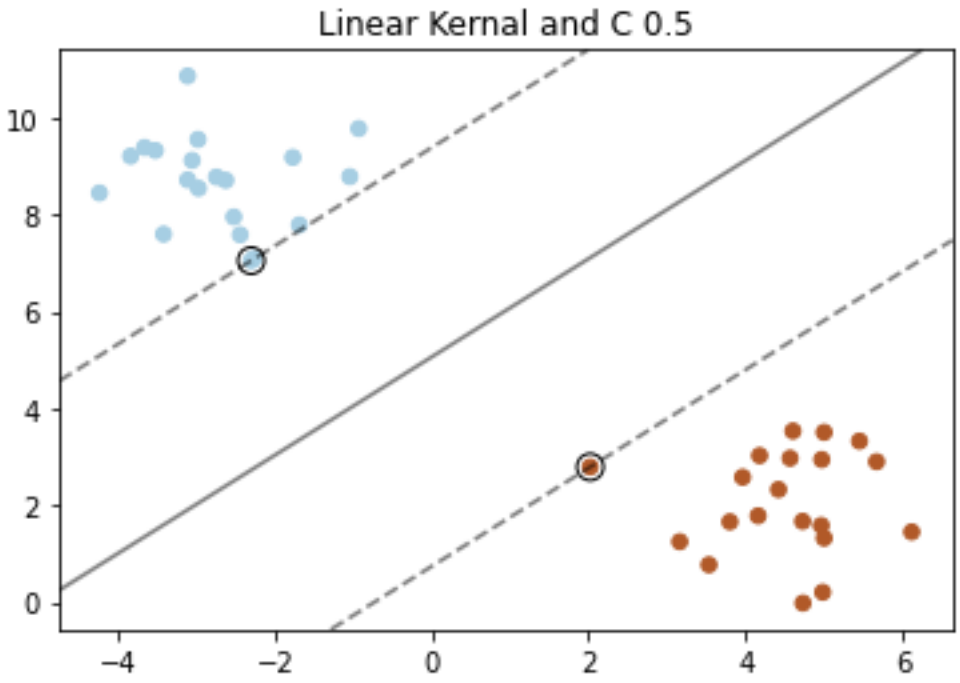
Linear model

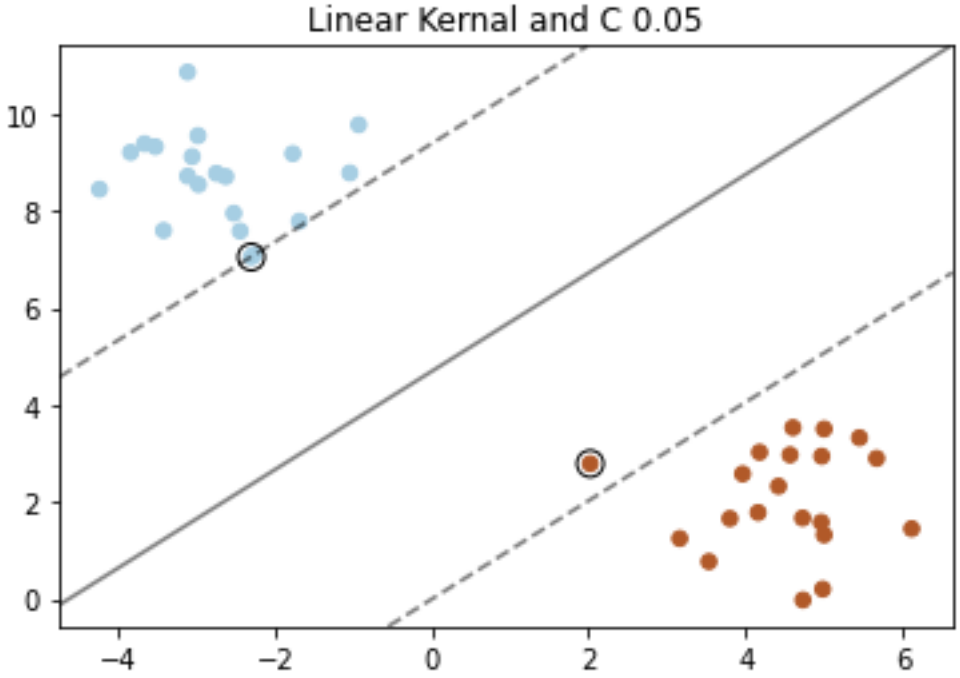

RBF and gamma 0.2
10
8
6
4
2
0
−4
−2
0
2
4
6

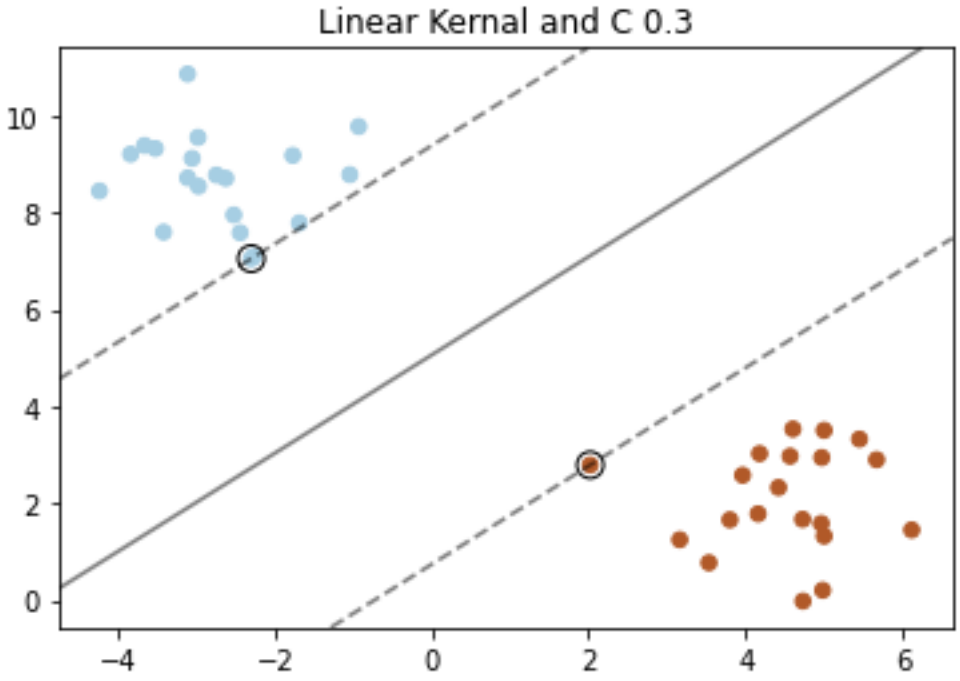

RBF and gamma 0
10
8
6
4
2
0
−4
−2
0
2
4
6

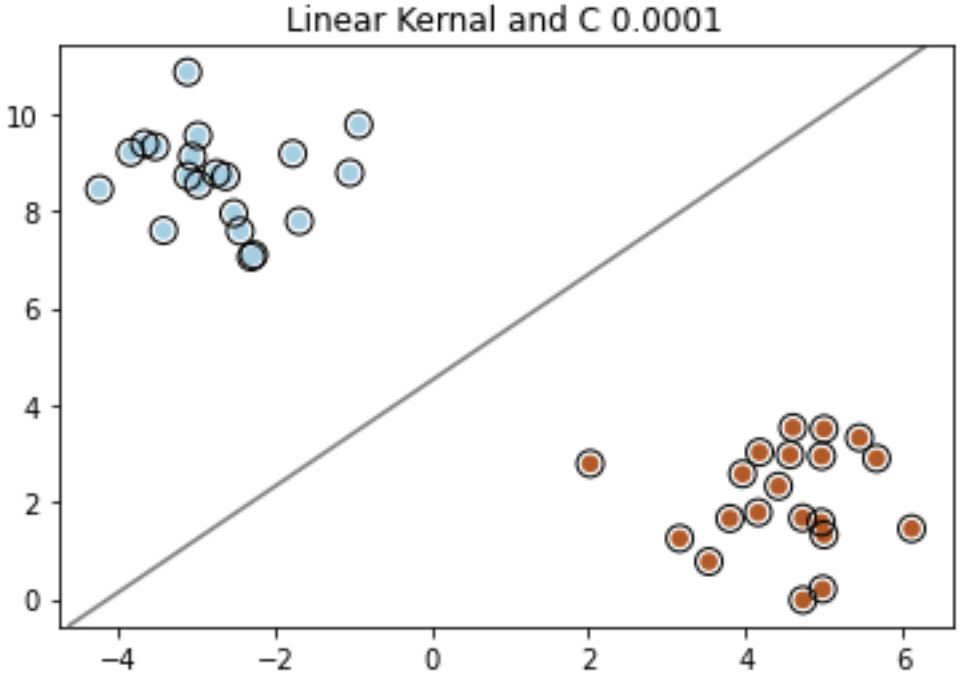


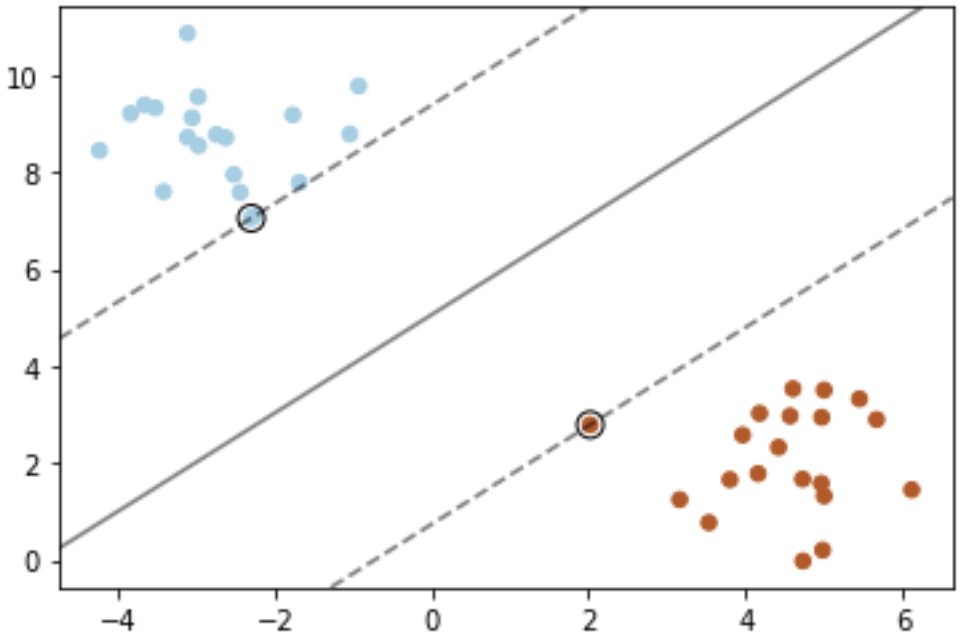
1. How many support vectors are there for each class for each case of `C`?
   Number of support vectors are high when C=0.0001.otherwise two support vectors.
2. How many of those support vectors are within the margins?.
   two
3. Are any support vectors misclassified? If so, why?


Linear Kernal and C 0.5
10
8
6
4
2
0
−4
−2
0
2
4
6

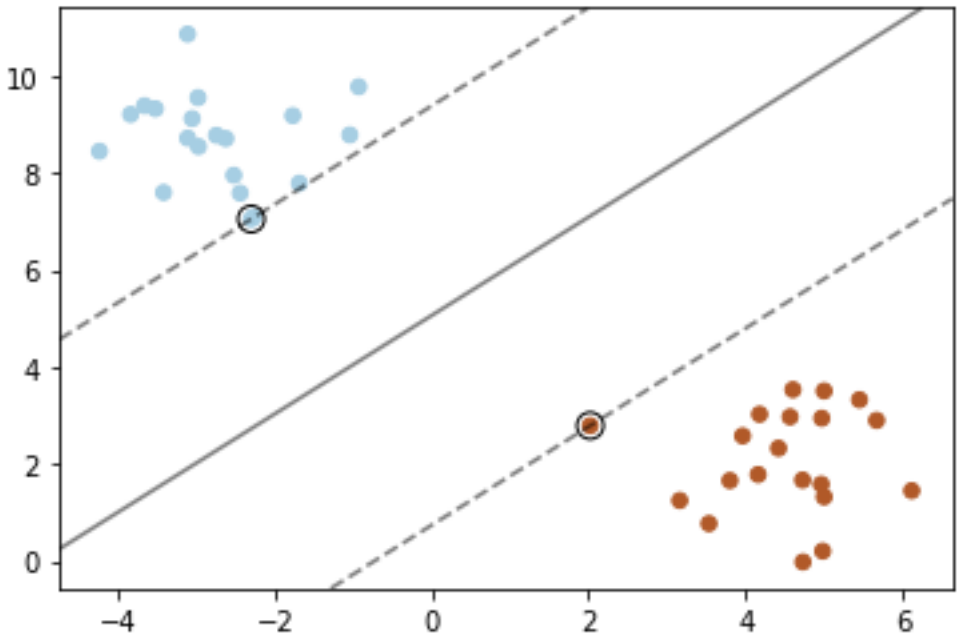

Linear Kernal and C 0.05
10
8
6
4
2
0
−4
−2
0
2
4
6


Linear Kernal and C 0.3
10
8
6
4
2
0
−4
−2
0
2
4
6


Linear Kernal and C 0.0001
10
8
6
4
2
0
−4
−2
0
2
4
6



Linear Kernal and C 1000



Compare the results of your `train_test_SVM` function between linear, radial basis and polynomial kernel functions.

Which method seems to be the best for the task?

Kernel=linear

```
(455, 30) (455,)
(114, 30) (114,)
[[42  1]
 [ 6 65]]
              precision    recall  f1-score   support

         0.0       0.88      0.98      0.92        43
         1.0       0.98      0.92      0.95        71

    accuracy                           0.94       114
   macro avg       0.93      0.95      0.94       114
weighted avg       0.94      0.94      0.94       114

0.9385964912280702
```

Kernal=radial basis function

```
(455, 30) (455,)
(114, 30) (114,)
[[41  2]
 [ 1 70]]
              precision    recall  f1-score   support

         0.0       0.98      0.95      0.96        43
         1.0       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

0.9736842105263158

In [213]:
```