

In [75]:

```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
```

In [76]:

```
from PIL import Image
```

In [77]:

```
dataset= pd.read_csv('Dataset.csv')
```

In [78]:

```
x= dataset.iloc[:,1:].values
```

In [79]:

```
type(x)
```

Out[79]:

numpy.ndarray

In [80]:

```
y= dataset.iloc[:,0].values
```

In [81]:

```
np.where(y==3)
```

Out[81]:

```
(array([ 7, 9, 13, ..., 41984, 41985, 41990], dtype=int64),)
```

In [82]:

```
x[7,:].reshape(28,28)
```

Out[82]:

```
array([[ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
        0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
        0,  0],
       [ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
        0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
        0,  0],
       [ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
        0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
        0,  0],
       [ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
        0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
        0,  0],
       [ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
        0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
        0,  0],
       [ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
        0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
        0,  0],
       [ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0, 21, 130, 190, 254,
        254, 250, 175, 135, 96, 96, 16, 4, 0, 0, 0, 0, 0,
        0, 0],
       [ 0,  0,  0,  0,  0,  0, 26, 102, 186, 254, 254, 248, 222,
        222, 225, 254, 254, 254, 254, 254, 206, 112, 4, 0, 0, 0,
        0, 0],
       [ 0,  0,  0,  0,  0,  0, 207, 254, 254, 177, 117, 39, 0,
        0, 56, 248, 102, 48, 48, 103, 192, 254, 135, 0, 0, 0,
        0, 0],
       [ 0,  0,  0,  0,  0,  0, 91, 111, 36, 0, 0, 0, 0,
        0, 72, 92, 0, 0, 0, 0, 12, 224, 210, 5, 0, 0, 0,
        0, 0],
       [ 0,  0,  0,  0,  0,  0, 0, 0, 0, 0, 0, 0, 0,
        0, 0, 0, 0, 0, 50, 139, 240, 254, 66, 0, 0, 0,
        0, 0],
       [ 0,  0,  0,  0,  0,  0, 0, 0, 0, 0, 0, 0, 0,
        0, 0, 0, 7, 121, 220, 254, 244, 194, 15, 0, 0, 0,
        0, 0],
       [ 0,  0,  0,  0,  0,  0, 0, 8, 107, 112, 112, 112, 87,
        112, 141, 218, 248, 177, 68, 20, 0, 0, 0, 0, 0,
        0, 0],
       [ 0,  0,  0,  0,  0,  0, 0, 77, 221, 254, 254, 254, 254,
        254, 225, 104, 39, 0, 0, 0, 0, 0, 0, 0, 0,
        0, 0],
       [ 0,  0,  0,  0,  0,  0, 0, 0, 10, 32, 32, 32, 32,
        130, 215, 195, 47, 0, 0, 0, 0, 0, 0, 0, 0,
        0, 0],
       [ 0,  0,  0,  0,  0,  0, 0, 0, 0, 0, 0, 0, 0,
        0, 0, 6, 111, 231, 174, 5, 0, 0, 0, 0, 0, 0,
        0, 0],
       [ 0,  0,  0,  0,  0, 47, 18, 0, 0, 0, 0, 0, 0,
        0, 0, 0, 0, 40, 228, 205, 35, 0, 0, 0, 0, 0,
        0, 0],
       [ 0,  0,  0,  0, 22, 234, 42, 0, 0, 0, 0, 0, 0,
        0, 0, 0, 0, 56, 212, 226, 38, 0, 0, 0, 0, 0,
        0, 0],
       [ 0,  0,  0,  0, 96, 157, 0, 0, 0, 0, 0, 0, 0,
        0, 0, 0, 0, 96, 157, 0, 0, 0, 0, 0, 0, 0,
        0, 0]
```

```

0, 0, 0, 0, 0, 30, 215, 188, 9, 0, 0, 0, 0,
0, 0],
[ 0, 0, 0, 0, 96, 142, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 86, 254, 68, 0, 0, 0, 0,
0, 0],
[ 0, 0, 0, 0, 71, 202, 15, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 6, 214, 151, 0, 0, 0, 0,
0, 0],
[ 0, 0, 0, 0, 10, 231, 86, 2, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 191, 207, 0, 0, 0, 0,
0, 0],
[ 0, 0, 0, 0, 0, 93, 248, 129, 7, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 117, 238, 112, 0, 0, 0, 0,
0, 0],
[ 0, 0, 0, 0, 0, 0, 94, 248, 209, 73, 12, 0, 0,
0, 0, 0, 0, 42, 147, 252, 136, 9, 0, 0, 0,
0, 0],
[ 0, 0, 0, 0, 0, 0, 0, 48, 160, 215, 230, 158, 74,
64, 94, 153, 223, 250, 214, 105, 0, 0, 0, 0, 0,
0, 0],
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 11, 129, 189, 234,
224, 255, 194, 134, 75, 6, 0, 0, 0, 0, 0, 0,
0, 0],
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0],
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0]], dtype=int64)

```

In [83]:

```
plt.imshow(x[7,:].reshape(28,28))
```

Out[83]:

<matplotlib.image.AxesImage at 0x277116d3240>

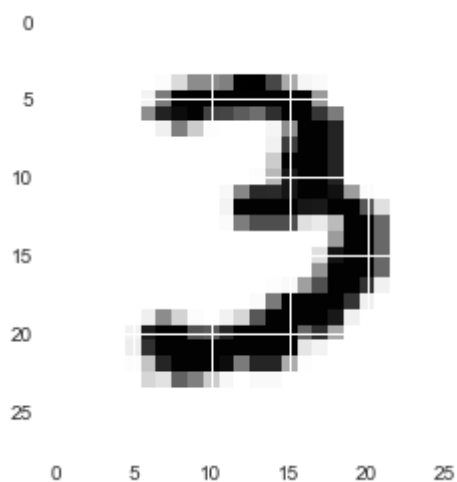


In [84]:

```
plt.imshow(x[9,:].reshape(28,28))
```

Out[84]:

<matplotlib.image.AxesImage at 0x27710988b00>

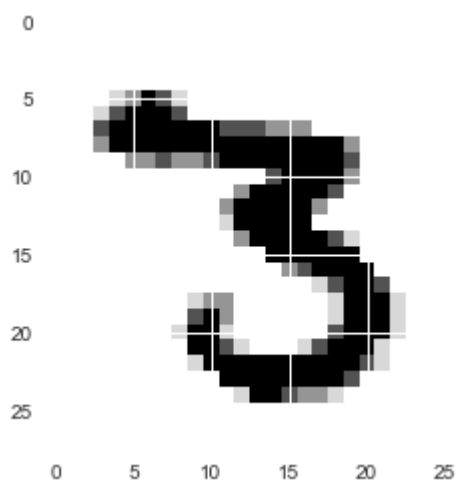


In [85]:

```
plt.imshow(x[13,:].reshape(28,28))
```

Out[85]:

<matplotlib.image.AxesImage at 0x277105bb2e8>

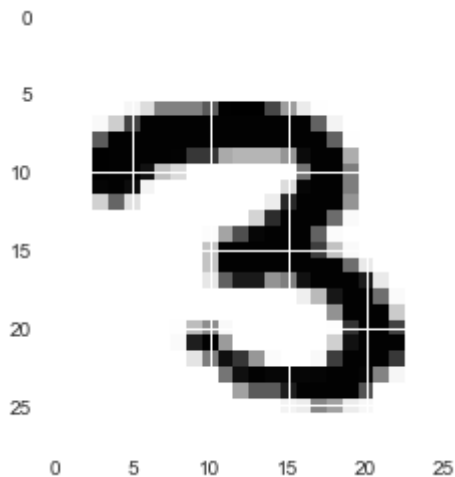


In [86]:

```
plt.imshow(x[41984,:].reshape(28,28))
```

Out[86]:

<matplotlib.image.AxesImage at 0x277106479b0>

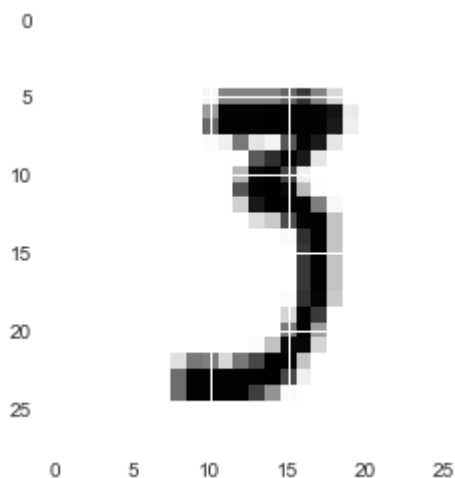


In [87]:

```
plt.imshow(x[41985,:].reshape(28,28))
```

Out[87]:

<matplotlib.image.AxesImage at 0x277106dd198>



In [88]:

```
np.where(y[1:100]==5)
```

Out[88]:

(array([ 7, 18, 50, 61, 79, 98], dtype=int64),)

In [89]:

```
np.where(y==5)
```

Out[89]:

(array([ 8, 19, 51, ..., 41942, 41987, 41989], dtype=int64),)

In [90]:

```
plt.imshow(x[8,:].reshape(28,28))
```

Out[90]:

<matplotlib.image.AxesImage at 0x2771076aa90>

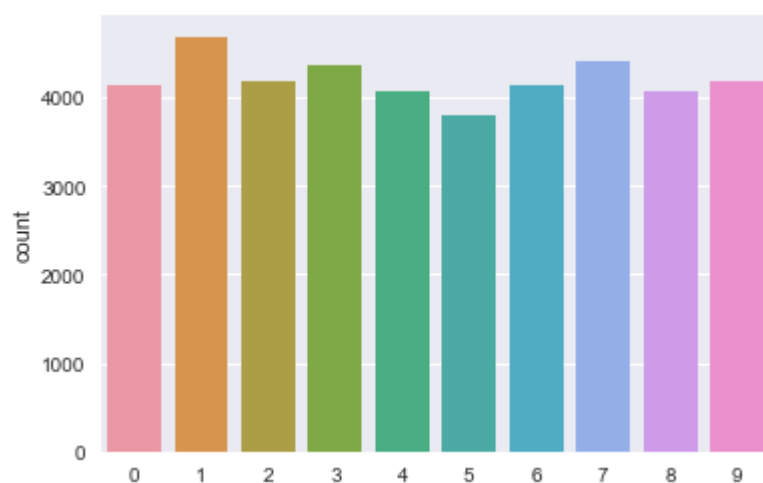


In [91]:

```
sns.countplot(y)
```

Out[91]:

<matplotlib.axes.\_subplots.AxesSubplot at 0x2771077d3c8>



In [92]:

```
from sklearn.model_selection import train_test_split
```

In [93]:

```
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.4,random_state=3)
```

In [94]:

```
from sklearn.svm import SVC
```

In [95]:

```
from sklearn.model_selection import GridSearchCV
```

In [107]:

```
model=SVC(kernel='poly',C=1,gamma=1)
```

In [97]:

```
parameters = {  
'C':(1,10),  
'gamma': (1,0.1)}
```

In [98]:

```
clf = GridSearchCV(model, parameters)
```

In [99]:

```
clf.fit(x_train,y_train)
```

Out[99]:

```
GridSearchCV(cv=None, error_score='raise',  
             estimator=SVC(C=1.0, cache_size=200, class_weight=None, coef0=0.0,  
                           decision_function_shape=None, degree=3, gamma='auto', kernel='poly',  
                           max_iter=-1, probability=False, random_state=None, shrinking=True,  
                           tol=0.001, verbose=False),  
             fit_params={}, iid=True, n_jobs=1,  
             param_grid={'C': (1, 10), 'gamma': (1, 0.1)},  
             pre_dispatch='2*n_jobs', refit=True, return_train_score=True,  
             scoring=None, verbose=0)
```

In [104]:

```
clf.best_params_
```

Out[104]:

```
{'C': 1, 'gamma': 1}
```

In [108]:

```
model.fit(x_train,y_train)
```

Out[108]:

```
SVC(C=1, cache_size=200, class_weight=None, coef0=0.0,  
    decision_function_shape=None, degree=3, gamma=1, kernel='poly',  
    max_iter=-1, probability=False, random_state=None, shrinking=True,  
    tol=0.001, verbose=False)
```

In [111]:

```
pred=model.predict(x_test)
```

In [110]:

pred

Out[110]:

array([4, 4, 6, ..., 1, 4, 2], dtype=int64)

In [112]:

**from** sklearn.metrics **import** confusion\_matrix,accuracy\_score

In [113]:

confusion\_matrix(y\_test,pred)

Out[113]:

```
array([[1622,  0,  2,  1,  0,  4,  5,  0,  3,  0],
       [  0, 1804,  9,  4,  3,  1,  2,  6,  4,  1],
       [  8,  9, 1584,  3,  7,  2,  4, 10,  5,  0],
       [  2,  5,  22, 1640,  0, 15,  1,  7, 11,  8],
       [  6,  5,  7,  0, 1607,  1, 10,  4,  1, 25],
       [  5,  0,  1, 21,  5, 1519, 14,  1,  8,  5],
       [ 11,  4,  2,  0,  2,  6, 1592,  0,  4,  0],
       [  2,  6, 11,  0,  7,  0,  0, 1735,  1, 17],
       [ 10, 10, 13, 11, 10, 16,  4,  2, 1568,  8],
       [  6,  2,  2,  6, 16,  5,  1, 17,  7, 1627]])
```

In [114]:

accuracy\_score(y\_test,pred)

Out[114]:

0.97011904761904766

In [29]:

Classification=pd.read\_csv('C:/Users/HP/Documents/Summer\_Intern\_Of \_ML/Images and Numpy/Cla

In [30]:

type(Classification)

Out[30]:

pandas.core.frame.DataFrame

In [31]:

a=Classification.iloc[3:4,:].values

In [32]:

```
pred_a=model.predict(a)
pred_a
```

Out[32]:

array([9], dtype=int64)



In [33]:

```
plt.imshow(a.reshape(28,28))
```

Out[33]:

<matplotlib.image.AxesImage at 0x27710cfdd30>



In [34]:

```
b=Classification.iloc[6000:6001,:].values
```

In [35]:

```
pred_b=model.predict(b)  
pred_b
```

Out[35]:

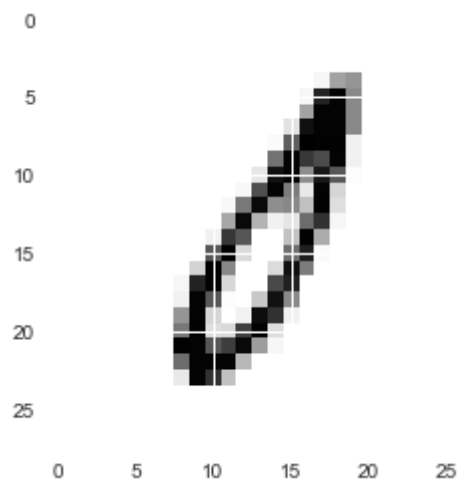
```
array([1], dtype=int64)
```

In [36]:

```
plt.imshow(b.reshape(28,28))
```

Out[36]:

<matplotlib.image.AxesImage at 0x27710cb9390>



In [37]:

```
c=Classification.iloc[15000:15001,:].values
```

In [38]:

```
pred_c=model.predict(c)
```

In [39]:

```
pred_c
```

Out[39]:

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

In [40]:

```
plt.imshow(c.reshape(28,28))
```

Out[40]:

```
<matplotlib.image.AxesImage at 0x2770fe2c3c8>
```



In [41]:

```
d=Classification.iloc[17000:17001,:].values
```

In [42]:

```
pred_d=model.predict(d)
```

In [43]:

```
pred_d
```

Out[43]:

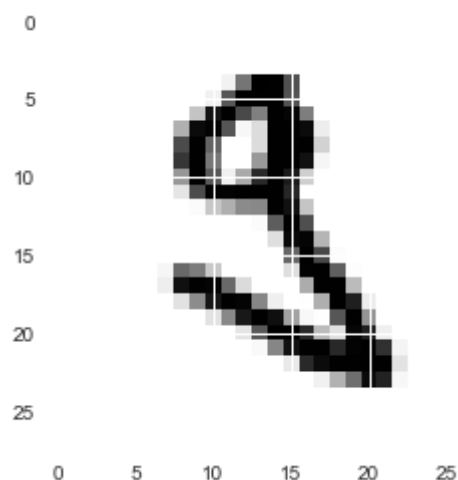
```
array([2], dtype=int64)
```

In [44]:

```
plt.imshow(d.reshape(28,28))
```

Out[44]:

<matplotlib.image.AxesImage at 0x2770febdd30>



In [45]:

```
e=Classification.iloc[128:129,:].values
```

In [46]:

```
pred_e=model.predict(e)
```

In [47]:

```
pred_e
```

Out[47]:

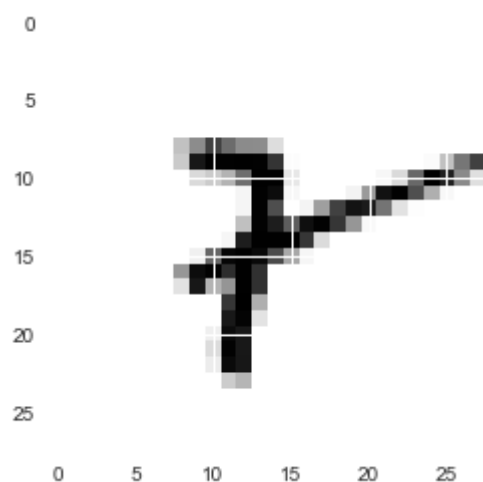
```
array([8], dtype=int64)
```

In [48]:

```
plt.imshow(e.reshape(28,28))
```

Out[48]:

<matplotlib.image.AxesImage at 0x2770ff526d8>



In [49]:

```
f=Classification.iloc[138:139,:].values
```

In [50]:

```
pred_f=model.predict(f)
```

In [51]:

```
pred_f
```

Out[51]:

```
array([5], dtype=int64)
```

In [52]:

```
plt.imshow(f.reshape(28,28))
```

Out[52]:

```
<matplotlib.image.AxesImage at 0x2770ffe90f0>
```



In [53]:

```
g=Classification.iloc[139:140,:].values
```

In [54]:

```
pred_g=model.predict(g)  
pred_g
```

Out[54]:

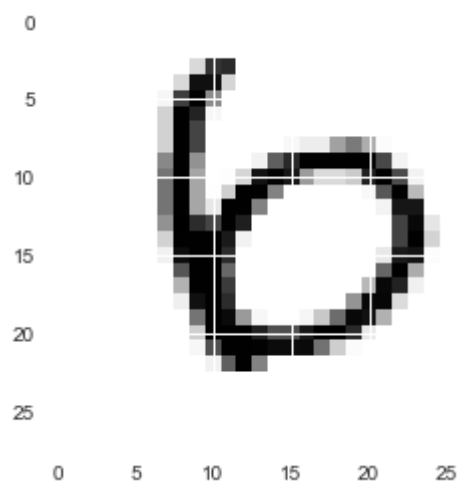
```
array([0], dtype=int64)
```

In [55]:

```
plt.imshow(g.reshape(28,28))
```

Out[55]:

<matplotlib.image.AxesImage at 0x27710076a58>



In [56]:

```
h=Classification.iloc[165:166,:].values
```

In [57]:

```
pred_h=model.predict(h)  
pred_h
```

Out[57]:

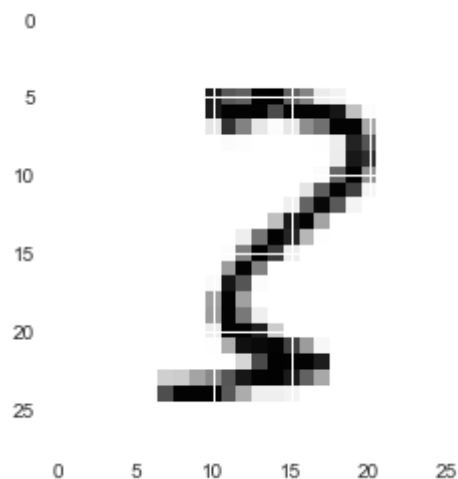
```
array([2], dtype=int64)
```

In [58]:

```
plt.imshow(h.reshape(28,28))
```

Out[58]:

<matplotlib.image.AxesImage at 0x2771010b3c8>



In [59]:

```
i=Classification.iloc[341:342,:].values  
pred_i=model.predict(i)  
pred_i
```

Out[59]:

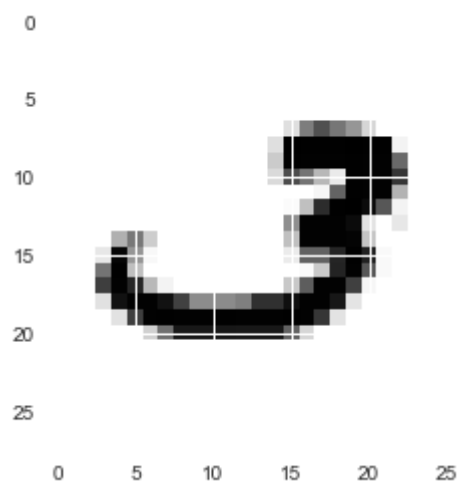
```
array([2], dtype=int64)
```

In [60]:

```
plt.imshow(i.reshape(28,28))
```

Out[60]:

<matplotlib.image.AxesImage at 0x2771019a9e8>



In [61]:

```
j=Classification.iloc[408:409,:].values  
pred_j=model.predict(j)  
pred_j
```

Out[61]:

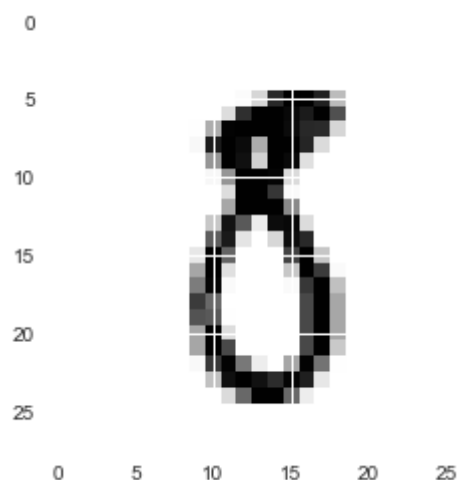
```
array([5], dtype=int64)
```

In [62]:

```
plt.imshow(j.reshape(28,28))
```

Out[62]:

<matplotlib.image.AxesImage at 0x27710231278>



In [63]:

```
k=Classification.iloc[509:510,:].values  
pred_k=model.predict(k)  
pred_k
```

Out[63]:

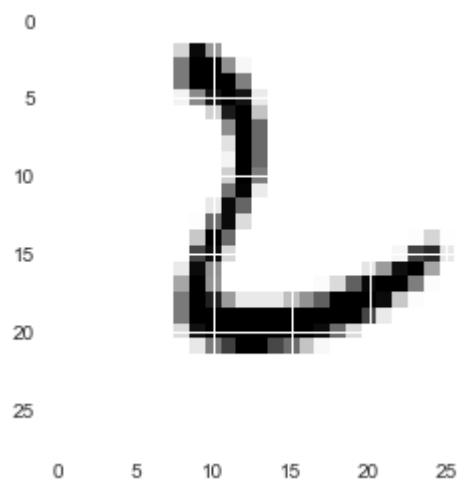
```
array([6], dtype=int64)
```

In [64]:

```
plt.imshow(k.reshape(28,28))
```

Out[64]:

<matplotlib.image.AxesImage at 0x277102c1c88>



In [65]:

```
l=Classification.iloc[511:512,:].values  
pred_l=model.predict(l)  
pred_l
```

Out[65]:

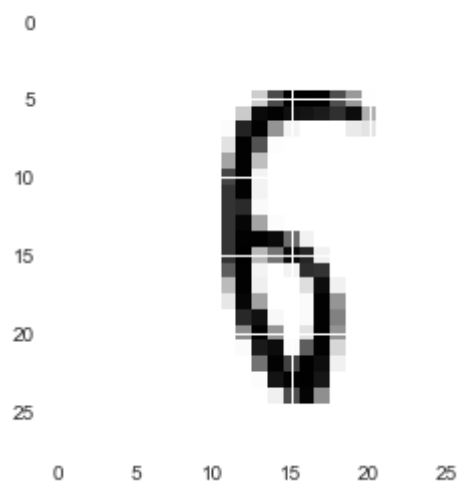
```
array([5], dtype=int64)
```

In [66]:

```
plt.imshow(l.reshape(28,28))
```

Out[66]:

<matplotlib.image.AxesImage at 0x277103574e0>



In [67]:

```
m=Classification.iloc[626:627,:].values  
pred_m=model.predict(m)  
pred_m
```

Out[67]:

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

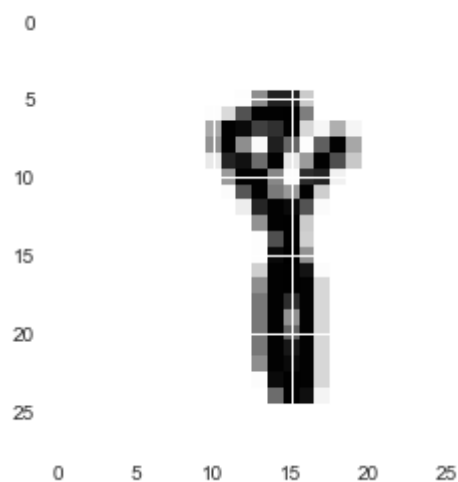


In [68]:

```
plt.imshow(m.reshape(28,28))
```

Out[68]:

<matplotlib.image.AxesImage at 0x277103e8748>



In [69]:

```
n=Classification.iloc[710:711,:].values  
pred_n=model.predict(n)  
pred_n
```

Out[69]:

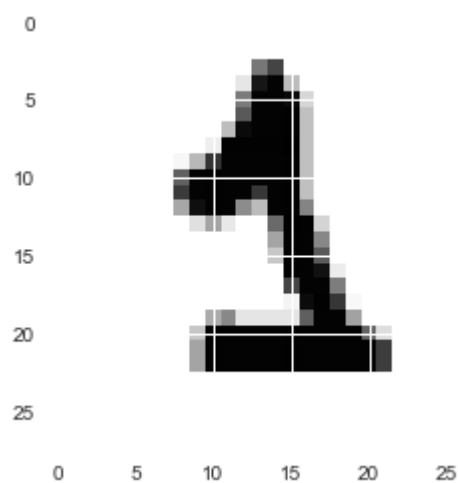
array([5], dtype=int64)

In [70]:

```
plt.imshow(n.reshape(28,28))
```

Out[70]:

<matplotlib.image.AxesImage at 0x2771047c4a8>



In [71]:

```
o=Classification.iloc[2816:2817,:].values  
pred_o=model.predict(o)  
pred_o
```

Out[71]:

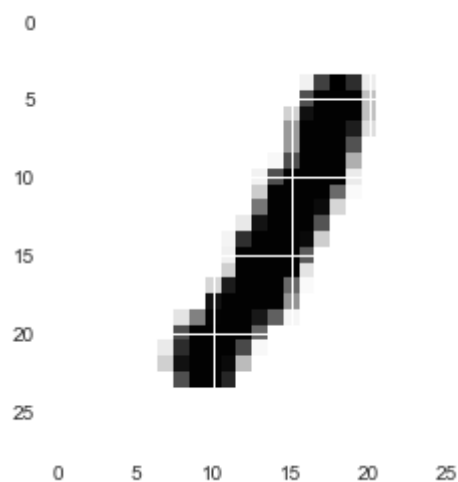
```
array([1], dtype=int64)
```

In [72]:

```
plt.imshow(o.reshape(28,28))
```

Out[72]:

<matplotlib.image.AxesImage at 0x2771050be10>



In [73]:

```
p=Classification.iloc[:,:]
```

In [ ]: