In [ ]:

```
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd

import seaborn as sns

from sklearn.decomposition import PCA
```

Получение данных из датасета с винами

In [ ]:

```
wineQT = pd.read_csv('./WineQT.csv').drop(columns=['Id'])

X = []


for i in wineQT.values.tolist():

    X.append(i)
```

In [ ]:

```
wineQT
```

Out[ ]:

	fixed acidity	volatile acidity	citric acid	residual sugar	chlorides	free sulfur dioxide	total sulfur dioxide	density	pH	sulphates	alcohol	quality
0	7.4	0.700	0.00	1.9	0.076	11.0	34.0	0.99780	3.51	0.56	9.4	5
1	7.8	0.880	0.00	2.6	0.098	25.0	67.0	0.99680	3.20	0.68	9.8	5
2	7.8	0.760	0.04	2.3	0.092	15.0	54.0	0.99700	3.26	0.65	9.8	5
3	11.2	0.280	0.56	1.9	0.075	17.0	60.0	0.99800	3.16	0.58	9.8	6
4	7.4	0.700	0.00	1.9	0.076	11.0	34.0	0.99780	3.51	0.56	9.4	5
...	...	...	...	...	...	...	...	...	...	...	...	...
1138	6.3	0.510	0.13	2.3	0.076	29.0	40.0	0.99574	3.42	0.75	11.0	6
1139	6.8	0.620	0.08	1.9	0.068	28.0	38.0	0.99651	3.42	0.82	9.5	6
1140	6.2	0.600	0.08	2.0	0.090	32.0	44.0	0.99490	3.45	0.58	10.5	5
1141	5.9	0.550	0.10	2.2	0.062	39.0	51.0	0.99512	3.52	0.76	11.2	6
1142	5.9	0.645	0.12	2.0	0.075	32.0	44.0	0.99547	3.57	0.71	10.2	5

1143 rows × 12 columns

Понимажем размерность данных при помощи метода главных компонент и визуализируем данные

In [ ]:

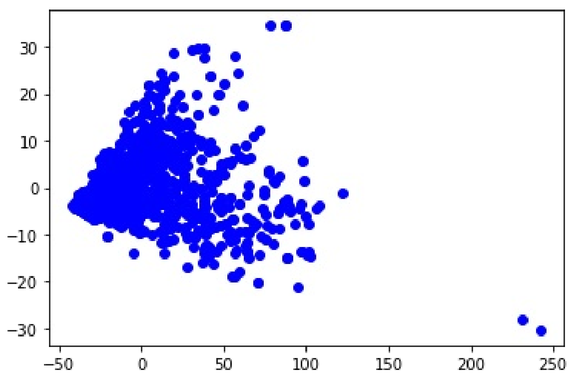
```
pca = PCA(n_components = 2)
XPCAreduced = pca.fit_transform(X)
```

In [ ]:

```
plt.plot([i[0] for i in XPCAreduced], [i[1] for i in XPCAreduced], 'bo')
```

Out[ ]:

```
[<matplotlib.lines.Line2D at 0x293851846d0>]
```

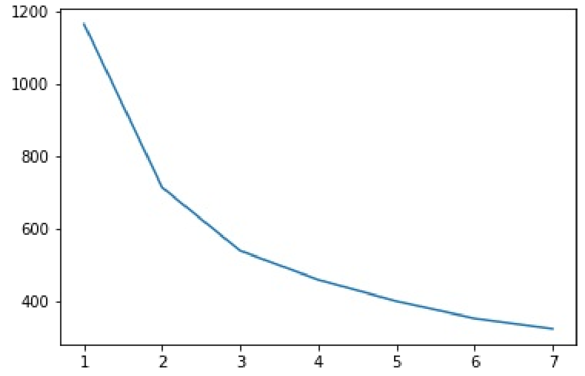


Находим оптимальное количество кластеров

In [ ]:

```
from sklearn.cluster import KMeans
```

```
inertia = []
for k in range(1, 8):
    kmeans = KMeans(n_clusters=k, random_state=1).fit(X)
    inertia.append(np.sqrt(kmeans.inertia_))

plt.plot(range(1, 8), inertia);
```



Видим что оптимальное количество кластеров равно трем ,обучаем модель, и классифицируем все вина

In [ ]:
```
n_clusters_have = 3

modl = KMeans(n_clusters=n_clusters_have, random_state=1).fit(X)
```

In [ ]:
```
predictions = []
for i in X:
    buf = modl.predict([i])
    predictions.append(buf)
```

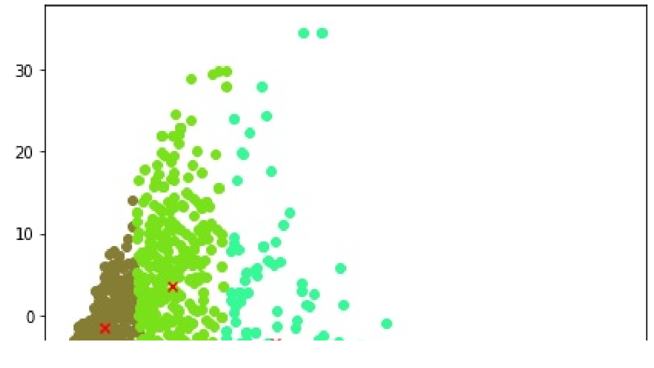
просто функция создания n случайных цветов

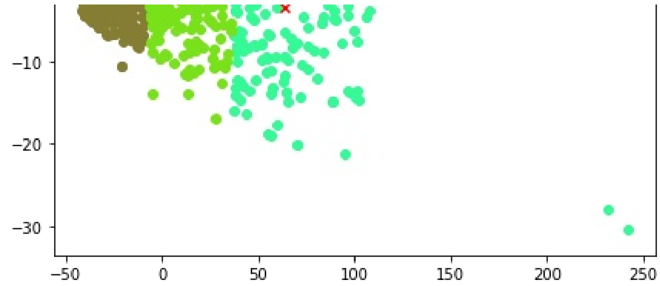
In [ ]:
```
import random
def create_rand_colors(number_of_colors):
    color = ["#"+''.join([random.choice('0123456789ABCDEF') for j in range(6)]) for i in range(number_of_colors)]
    return color
```

Визуализация классификации, крестиками центроиды

In [ ]:
```
colors = create_rand_colors(n_clusters_have)

plt.figure(figsize=(7,7))

results = [[] for i in range(n_clusters_have)]

for i in range(len(predictions)):
    pred = predictions[i][0]
    results[pred].append(XPCAreduced[i])

for i in range(n_clusters_have):
    plt.plot([i[0] for i in results[i]], [i[1] for i in results[i]], 'bo', c = colors[i])



for i in range(n_clusters_have):
    buf_class = pca.transform([modl.cluster_centers_[i]])[0]
    plt.scatter(buf_class[0], buf_class[1], marker = 'x', zorder = 999, c = '#ff0000')
```

```
C:\Users\grvla\AppData\Local\Temp/ipykernel_10708/3013347308.py:12: UserWarning: color is redundantly defined by
the 'color' keyword argument and the fmt string "bo" (-> color='b'). The keyword argument will take precedence.
  plt.plot([i[0] for i in results[i]], [i[1] for i in results[i]], 'bo', c = colors[i])
```



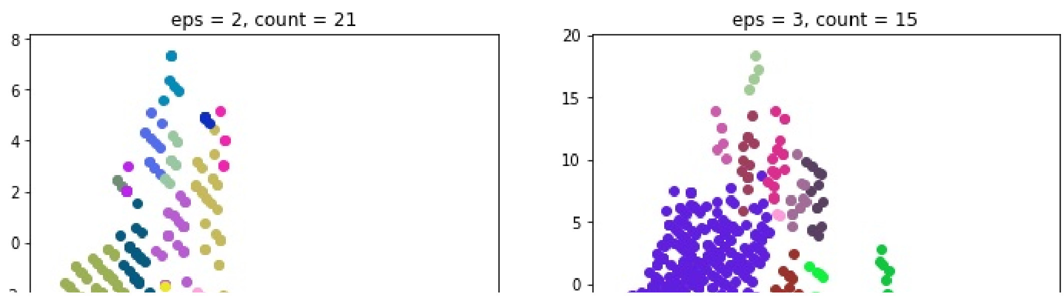


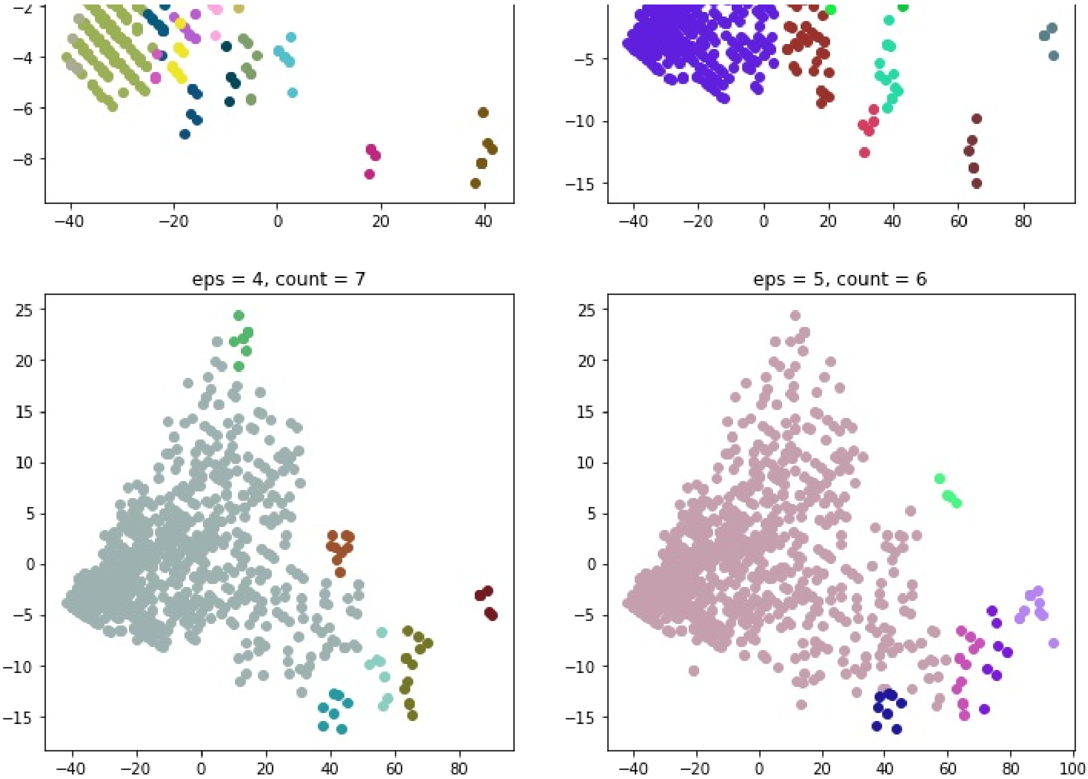
Создаем модель для ДБСКАНА делаем классификацию с разнимы значениями eps и делаем визуализацию

In [ ]:
```
from sklearn.cluster import DBSCAN
```

In [ ]:
```
variants = [2,3,4,5]

stolb = 2
strok = len(variants) // stolb + len(variants) % stolb

plt.figure(figsize=(12, 12))

for index in range(len(variants)):

    plt.subplot(strok,stolb,index + 1)


    lengh_variable = variants[index]

    dbscanpredicts = DBSCAN(eps = lengh_variable).fit_predict(X)
    number_of_dbscan_clusters = max(dbscanpredicts) + 1

    buf = {}
    for i in list(set(dbscanpredicts)):
        buf[i] = 0

    for i in dbscanpredicts:
        buf[i] += 1

    count_c_dbscan = max(dbscanpredicts) + 1

    plt.title(f'eps = {variants[index]}, count = {count_c_dbscan}')

    colors = create_rand_colors(count_c_dbscan)

    results = [[] for i in range(count_c_dbscan)]

    for i in range(len(dbscanpredicts)):
        pred = dbscanpredicts[i]
        if pred != -1:
            results[pred].append(XPCAreduced[i])

    for i in range(count_c_dbscan):
        plt.plot([i[0] for i in results[i]], [i[1] for i in results[i]], 'bo', c = colors[i])
```

```
C:\Users\grvla\AppData\Local\Temp/ipykernel_10708/2360339566.py:39: UserWarning: color is redundantly defined by
the 'color' keyword argument and the fmt string "bo" (-> color='b'). The keyword argument will take precedence.
  plt.plot([i[0] for i in results[i]], [i[1] for i in results[i]], 'bo', c = colors[i])
C:\Users\grvla\AppData\Local\Temp/ipykernel_10708/2360339566.py:39: UserWarning: color is redundantly defined by
the 'color' keyword argument and the fmt string "bo" (-> color='b'). The keyword argument will take precedence.
  plt.plot([i[0] for i in results[i]], [i[1] for i in results[i]], 'bo', c = colors[i])
C:\Users\grvla\AppData\Local\Temp/ipykernel_10708/2360339566.py:39: UserWarning: color is redundantly defined by
the 'color' keyword argument and the fmt string "bo" (-> color='b'). The keyword argument will take precedence.
  plt.plot([i[0] for i in results[i]], [i[1] for i in results[i]], 'bo', c = colors[i])
C:\Users\grvla\AppData\Local\Temp/ipykernel_10708/2360339566.py:39: UserWarning: color is redundantly defined by
the 'color' keyword argument and the fmt string "bo" (-> color='b'). The keyword argument will take precedence.
  plt.plot([i[0] for i in results[i]], [i[1] for i in results[i]], 'bo', c = colors[i])
```





In [ ]:

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