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

In [2]:
```
wine=pd.read_csv("E:\Data science training\R AND PYTHON KPMG\stat and ml\ASSIGNMENT\Wine Clustering.csv")
wine.head()
```

Out[2]:

	Alcohol	Malic_Acid	Ash	Ash_Alcanity	Magnesium	Total_Phenols	Flavanoids	Nonflavanoid_Phenols	Proanthocyanins	Color_Intensity	Hue	OD280	Proline
0	14.23	1.71	2.43	15.6	127	2.80	3.06	0.28	2.29	5.64	1.04	3.92	1065
1	13.20	1.78	2.14	11.2	100	2.65	2.76	0.26	1.28	4.38	1.05	3.40	1050
2	13.16	2.36	2.67	18.6	101	2.80	3.24	0.30	2.81	5.68	1.03	3.17	1185
3	14.37	1.95	2.50	16.8	113	3.85	3.49	0.24	2.18	7.80	0.86	3.45	1480
4	13.24	2.59	2.87	21.0	118	2.80	2.69	0.39	1.82	4.32	1.04	2.93	735

Building the clustering model:

In [3]:
```
from sklearn.cluster import KMeans
```

In [4]:
```
##Plotting the elbow value first
for i in range(1,11):
    print(i)
```

```
1
2
3
4
5
6
7
8
9
10
```

In [5]:
```
error = []
for k in range(1,11):
    km = KMeans(n_clusters=k)
    km.fit(wine)
    error.append(km.inertia_)
```

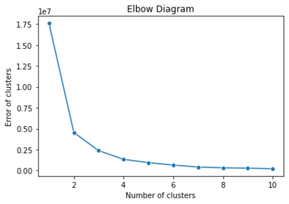
```
C:\Users\Pratik\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:1036: UserWarning: KMeans is known to have a memory leak on Windows with MKL, when there are less chunks than available threads. You can avoid it by setting the environment variable OMP_NUM_THREADS=1.
  warnings.warn(
```

In [6]:
```
error
```

Out[6]:
```
[17592296.383508474,
 4543749.614531862,
 2370689.686782968,
 1333139.2086165315,
 935752.2742960759,
 647326.0020260846,
 412303.8282508013,
 323223.24705426674,
 272977.0201661897,
 218119.38847158226]
```

In [7]:
```
#Plottin the elbow curve
sns.lineplot(range(1,11),error,marker='o')
plt.title('Elbow Diagram')
plt.xlabel('Number of clusters')
plt.ylabel('Error of clusters')
plt.show()
```

```
C:\Users\Pratik\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variables as keyword args: x, y. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```



In [8]:
```
## from above Elbow Diagram We can say that no of Cluster =4 bcz from cluster 4 yhere not much change in the graph
```

In [9]:
```
km_4 = KMeans(n_clusters=4).fit(wine)
```

In [10]:
```
clusters = km_4.fit_predict(wine)
```

In [11]:
```
wine['Cluster'] = clusters
wine.head()
```

Out[11]:

	Alcohol	Malic_Acid	Ash	Ash_Alcanity	Magnesium	Total_Phenols	Flavanoids	Nonflavanoid_Phenols	Proanthocyanins	Color_Intensity	Hue	OD280	Proline	Cluster
0	14.23	1.71	2.43	15.6	127	2.80	3.06	0.28	2.29	5.64	1.04	3.92	1065	1
1	13.20	1.78	2.14	11.2	100	2.65	2.76	0.26	1.28	4.38	1.05	3.40	1050	1
2	13.16	2.36	2.67	18.6	101	2.80	3.24	0.30	2.81	5.68	1.03	3.17	1185	3
3	14.37	1.95	2.50	16.8	113	3.85	3.49	0.24	2.18	7.80	0.86	3.45	1480	3
4	13.24	2.59	2.87	21.0	118	2.80	2.69	0.39	1.82	4.32	1.04	2.93	735	2

In [12]:
```
## Interference of Each cluster
wine['Cluster'].value_counts()
```

Out[12]:
```
2    59
0    57
1    39
3    23
Name: Cluster, dtype: int64
```

In [13]:
```
## each Cluster have different value. we can see that most of the Data Points are belongs to Cluster 1 and Cluster 3
```

In [14]:
```
wine.groupby('Cluster')[['Alcohol','Ash_Alcanity','Total_Phenols','Color_Intensity','Proline']].mean().reset_index()
```

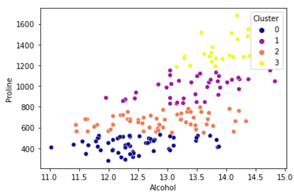
Out[14]:

	Cluster	Alcohol	Ash_Alcanity	Total_Phenols	Color_Intensity	Proline
0	0	12.475088	20.636842	2.105789	3.952105	435.578947
1	1	13.459487	18.125641	2.594359	5.219231	985.589744
2	2	12.870000	20.240678	2.027627	5.551525	659.220339
3	3	13.860000	17.073913	2.943043	6.260000	1338.565217

In [15]:
```
## I am taking two numeric columns are Alcohol and Proline and plot a scatter plot
sns.scatterplot(wine['Alcohol'],wine['Proline'],hue=wine['Cluster'],palette='plasma')
```

```
C:\Users\Pratik\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variables as keyword args: x, y. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
<AxesSubplot:xlabel='Alcohol', ylabel='Proline'>
```

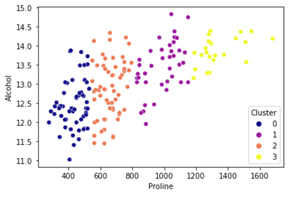
Out[15]:



In [16]:
```
sns.scatterplot(wine['Proline'],wine['Alcohol'],hue=wine['Cluster'],palette='plasma')
```

```
C:\Users\Pratik\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variables as keyword args: x, y. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
<AxesSubplot:xlabel='Proline', ylabel='Alcohol'>
```

Out[16]:



In [ ]: