Normalization

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

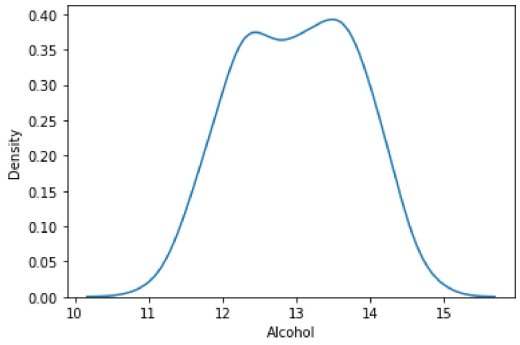
In [2]:
```
df = pd.read_csv('datasets/wine_data - wine_data.csv',header=None,usecols=[0,1,2])
df.columns=['class label','Alcohol','Malic acid']
df.head()
```

Out[2]:

	class label	Alcohol	Malic acid
0	1	14.23	1.71
1	1	13.20	1.78
2	1	13.16	2.36
3	1	14.37	1.95
4	1	13.24	2.59

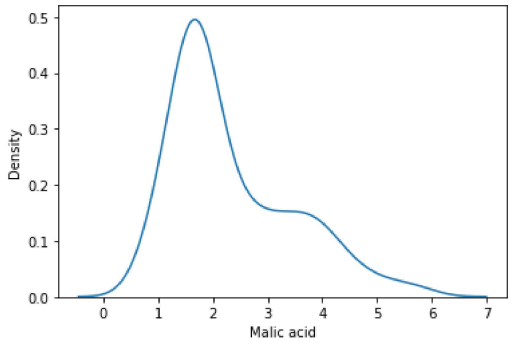
In [3]:
```
sns.kdeplot(df['Alcohol'])
```

Out[3]: <AxesSubplot:xlabel='Alcohol', ylabel='Density'>



In [4]:
```
sns.kdeplot(df['Malic acid'])
```

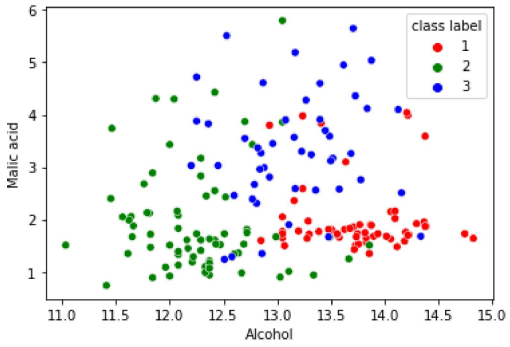
Out[4]: <AxesSubplot:xlabel='Malic acid', ylabel='Density'>



In [5]:
```
color_dict={1:'red',2:'green',3:'blue'}
sns.scatterplot(df['Alcohol'],df['Malic acid'],hue=df['class label'],palette=color_dict)
```

```
C:\Users\User15\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variables as keyword a
rgs: x, y. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explici
t keyword will result in an error or misinterpretation.
  warnings.warn(
```

Out[5]: <AxesSubplot:xlabel='Alcohol', ylabel='Malic acid'>



In [6]:
```
x = df.drop('class label',axis=1)
y = df['class label']
y
```

Out[6]:
```
0      1
1      1
2      1
3      1
4      1
      ..
173    3
174    3
175    3
176    3
177    3
Name: class label, Length: 178, dtype: int64
```

In [7]:
```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test = train_test_split(x,y,test_size=0.3,random_state=0)
```

In [8]:
```
x_train.shape,x_test.shape
```

Out[8]: ((124, 2), (54, 2))

In [9]:
```
from sklearn.preprocessing import MinMaxScaler #Normalization

scaler = MinMaxScaler()
```

In [10]:
```
scaler.fit(x_train)
```

Out[10]: MinMaxScaler()

In [11]:
```
x_train_scaled = scaler.fit_transform(x_train)
x_test_scaled = scaler.fit_transform(x_test)
```

In [12]:
```
x_test_scaled
```

Out[12]:
```
array([[0.68128655, 0.18379447],
       [0.40350877, 0.38142292],
       [0.28070175, 0.0770751 ],
       [0.62865497, 0.19565217],
       [0.47953216, 1.        ],
       [0.04385965, 0.25889328],
       [0.7748538 , 0.27865613],
       [0.27777778, 0.61067194],
       [0.24561404, 0.19565217],
       [0.19590643, 0.21541502],
       [0.57017544, 0.35968379],
       [0.72222222, 0.84980237],
       [0.81578947, 0.20158103],
       [0.28070175, 0.06521739],
       [0.63450292, 0.36363636],
       [0.17251462, 0.03557312],
       [0.6871345 , 0.15612648],
       [0.8128655 , 0.16798419],
       [0.35964912, 0.12252964],
```

In [13]:
```
x_train_scaled=pd.DataFrame(x_train_scaled,columns=x_train.columns)
x_test_scaled=pd.DataFrame(x_test_scaled,columns=x_test.columns)
```

In [14]:
```
x_train_scaled.describe()
```

Out[14]:

	Alcohol	Malic acid
count	124.000000	124.000000
mean	0.525017	0.313805
std	0.215414	0.238802
min	0.000000	0.000000
25%	0.358199	0.150735
50%	0.540323	0.209034
75%	0.701613	0.495273
max	1.000000	1.000000

In [15]:
```
x_test_scaled.describe()
```

Out[15]:

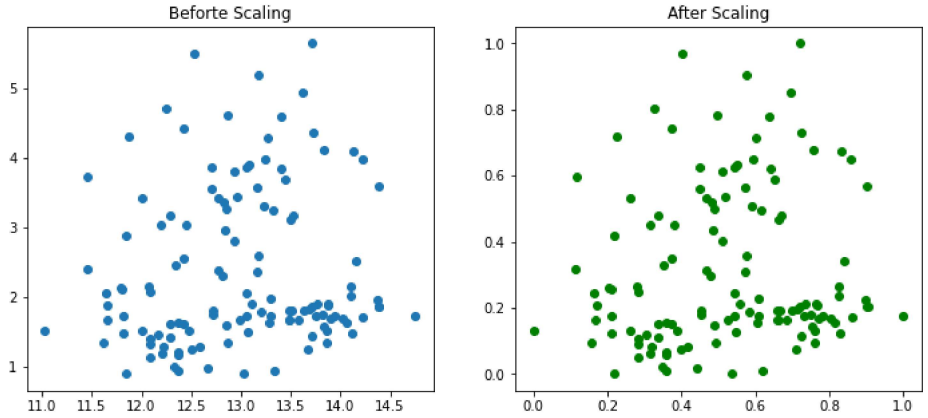
	Alcohol	Malic acid
count	54.000000	54.000000
mean	0.476879	0.293991
std	0.246098	0.212118
min	0.000000	0.000000
25%	0.278509	0.168972
50%	0.479532	0.203557
75%	0.675439	0.382905
max	1.000000	1.000000

In [16]:
```
import matplotlib.pyplot as plt
fig, (ax1,ax2) = plt.subplots(ncols=2, figsize =(12,5))

ax1.scatter(x_train['Alcohol'],x_train['Malic acid'])
ax1.set_title('Beforte Scaling')

ax2.scatter(x_train_scaled['Alcohol'],x_train_scaled['Malic acid'],color='green')
ax2.set_title('After Scaling')
```

Out[16]: Text(0.5, 1.0, 'After Scaling')



Effects of Outliers in Normalization

In [17]:
```
df.describe()
```

Out[17]:

	class label	Alcohol	Malic acid
count	178.000000	178.000000	178.000000
mean	1.938202	13.000618	2.336348
std	0.775035	0.811827	1.117146
min	1.000000	11.030000	0.740000
25%	1.000000	12.362500	1.602500
50%	2.000000	13.050000	1.865000
75%	3.000000	13.677500	3.082500
max	3.000000	14.830000	5.800000

In [18]:
```
df2 = pd.DataFrame({
    'Alcohol' : [30,35,40],
    'Malic acid' : [15,20,25],
    'class label' :[1,2,3]
})
```

In [19]:
```
df3 = df.append(df2)
df2.describe()
```

```
C:\Users\User15\AppData\Local\Temp\ipykernel_6208\1293780671.py:1: FutureWarning: The frame.append method is deprecated and wil
l be removed from pandas in a future version. Use pandas.concat instead.
  df3 = df.append(df2)
```

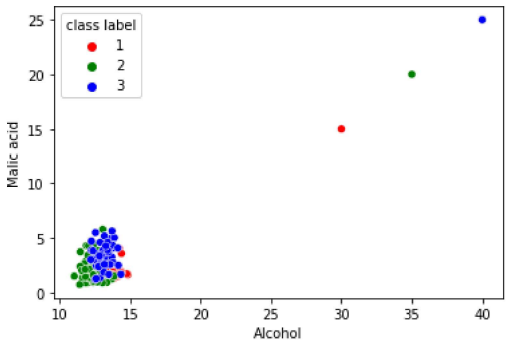
Out[19]:

	Alcohol	Malic acid	class label
count	3.0	3.0	3.0
mean	35.0	20.0	2.0
std	5.0	5.0	1.0
min	30.0	15.0	1.0
25%	32.5	17.5	1.5
50%	35.0	20.0	2.0
75%	37.5	22.5	2.5
max	40.0	25.0	3.0

In [20]:
```
color_dict={1:'red',2:'green',3:'blue'}
sns.scatterplot(df3['Alcohol'],df3['Malic acid'],hue=df3['class label'],palette=color_dict)
```

```
C:\Users\User15\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variables as keyword a
rgs: x, y. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explici
t keyword will result in an error or misinterpretation.
  warnings.warn(
```

Out[20]: <AxesSubplot:xlabel='Alcohol', ylabel='Malic acid'>



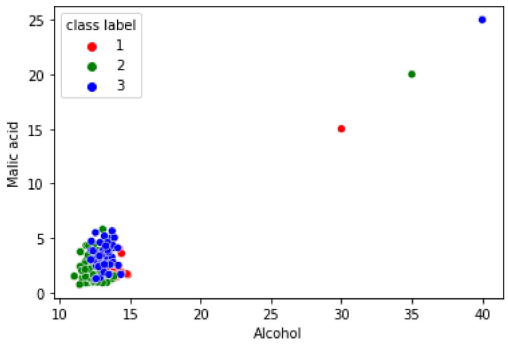
In [21]:
```
x_train_o, x_test_o ,y_train_o,y_test_o = train_test_split(df3.drop('class label',axis=1),df3['class label'],
                                                test_size=0.3,
                                                random_state=0)
```

In [22]:
```
x_train_scaled_o = pd.DataFrame(scaler.fit_transform(x_train_o),columns=x_train.columns)
x_test_scaled_o = pd.DataFrame(scaler.fit_transform(x_test_o),columns=x_test.columns)
```

In [23]:
```
color_dict = {1:'red',2:'green',3:'blue'}
sns.scatterplot(df3['Alcohol'],df3['Malic acid'],hue=df3['class label'],palette=color_dict)
```

```
C:\Users\User15\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variables as keyword a
rgs: x, y. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explici
t keyword will result in an error or misinterpretation.
  warnings.warn(
```

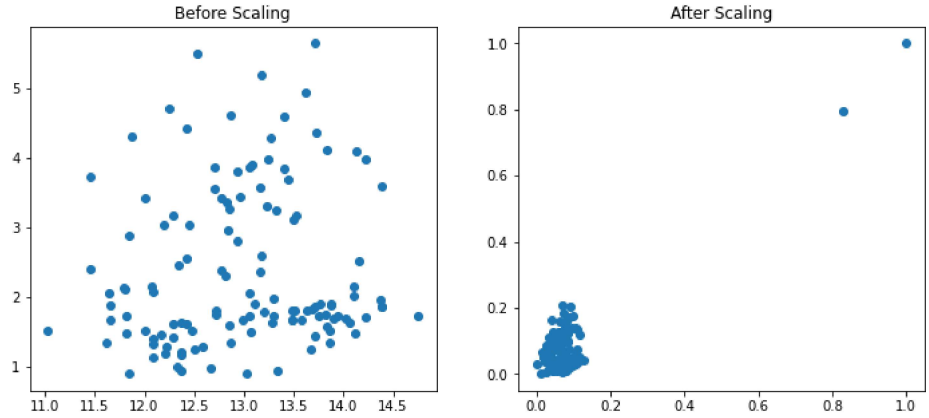
Out[23]: <AxesSubplot:xlabel='Alcohol', ylabel='Malic acid'>



In [24]:
```
from matplotlib import pyplot as plt
fig, (ax1,ax2) = plt.subplots(ncols=2,figsize=(12,5))

ax1.scatter(x_train['Alcohol'],x_train['Malic acid'])
ax1.set_title('Before Scaling')

ax2.scatter(x_train_scaled_o['Alcohol'],x_train_scaled_o['Malic acid'])
ax2.set_title('After Scaling')
plt.show()
```



In [ ]: