In [16]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings("ignore")
```

# Exploratory Data Analysis

In [17]:
```
data=pd.read_csv("/home/placement/Downloads/Advertising.csv")
```

In [18]:
```
data.describe()
```

Out[18]:

| | Unnamed: 0 | TV | radio | newspaper | sales |
|---|---|---|---|---|---|
| **count** | 200.000000 | 200.000000 | 200.000000 | 200.000000 | 200.000000 |
| **mean** | 100.500000 | 147.042500 | 23.264000 | 30.554000 | 14.022500 |
| **std** | 57.879185 | 85.854236 | 14.846809 | 21.778621 | 5.217457 |
| **min** | 1.000000 | 0.700000 | 0.000000 | 0.300000 | 1.600000 |
| **25%** | 50.750000 | 74.375000 | 9.975000 | 12.750000 | 10.375000 |
| **50%** | 100.500000 | 149.750000 | 22.900000 | 25.750000 | 12.900000 |
| **75%** | 150.250000 | 218.825000 | 36.525000 | 45.100000 | 17.400000 |
| **max** | 200.000000 | 296.400000 | 49.600000 | 114.000000 | 27.000000 |

In [19]:
```
data.head()
```

Out[19]:

| | Unnamed: 0 | TV | radio | newspaper | sales |
|---|---|---|---|---|---|
| **0** | 1 | 230.1 | 37.8 | 69.2 | 22.1 |
| **1** | 2 | 44.5 | 39.3 | 45.1 | 10.4 |
| **2** | 3 | 17.2 | 45.9 | 69.3 | 9.3 |
| **3** | 4 | 151.5 | 41.3 | 58.5 | 18.5 |
| **4** | 5 | 180.8 | 10.8 | 58.4 | 12.9 |

In [20]:
```
data1=data.drop(['Unnamed: 0'],axis=1)
data1
```

Out[20]:

| | TV | radio | newspaper | sales |
|---|---|---|---|---|
| **0** | 230.1 | 37.8 | 69.2 | 22.1 |
| **1** | 44.5 | 39.3 | 45.1 | 10.4 |
| **2** | 17.2 | 45.9 | 69.3 | 9.3 |
| **3** | 151.5 | 41.3 | 58.5 | 18.5 |
| **4** | 180.8 | 10.8 | 58.4 | 12.9 |
| **...** | ... | ... | ... | ... |
| **195** | 38.2 | 3.7 | 13.8 | 7.6 |
| **196** | 94.2 | 4.9 | 8.1 | 9.7 |
| **197** | 177.0 | 9.3 | 6.4 | 12.8 |
| **198** | 283.6 | 42.0 | 66.2 | 25.5 |
| **199** | 232.1 | 8.6 | 8.7 | 13.4 |

200 rows × 4 columns

In [21]:
```
y=data1['sales']
x=data1.drop('sales',axis=1)
```

In [22]:
```
y
```

Out[22]:
```
0      22.1
1      10.4
2       9.3
3      18.5
4      12.9
       ...
195     7.6
196     9.7
197    12.8
198    25.5
199    13.4
Name: sales, Length: 200, dtype: float64
```

In [23]:
```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.33,random_state=42)
```

In [24]:
```
from sklearn.linear_model import Lasso
from sklearn.model_selection  import GridSearchCV
lasso=Lasso()
parameters = {'alpha':[1e-15,1e-10,1e-8,1e-4,1e-3,1e-2,1,5,10,20]}
lasso_regressor = GridSearchCV(lasso,parameters)
lasso_regressor.fit(x_train,y_train)
```

Out[24]:
```
GridSearchCV(estimator=Lasso(),
             param_grid={'alpha': [1e-15, 1e-10, 1e-08, 0.0001, 0.001, 0.01, 1,
                                   5, 10, 20]})
```

**In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.**
**On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.**

In [25]:
```
lasso_regressor.best_params_
```

Out[25]:
```
{'alpha': 1}
```

In [26]:
```
lasso=Lasso(alpha=1)
lasso.fit(x_train,y_train)
y_pred_lasso=lasso.predict(x_test)
```

In [28]:
```
from sklearn.metrics import r2_score
r2_score(y_test,y_pred_lasso)
```

Out[28]: 0.8589079527148957

In [29]:
```
from sklearn.metrics import mean_squared_error
lasso_Error=mean_squared_error(y_pred_lasso,y_test)
lasso_Error
```

Out[29]: 3.641439660278575

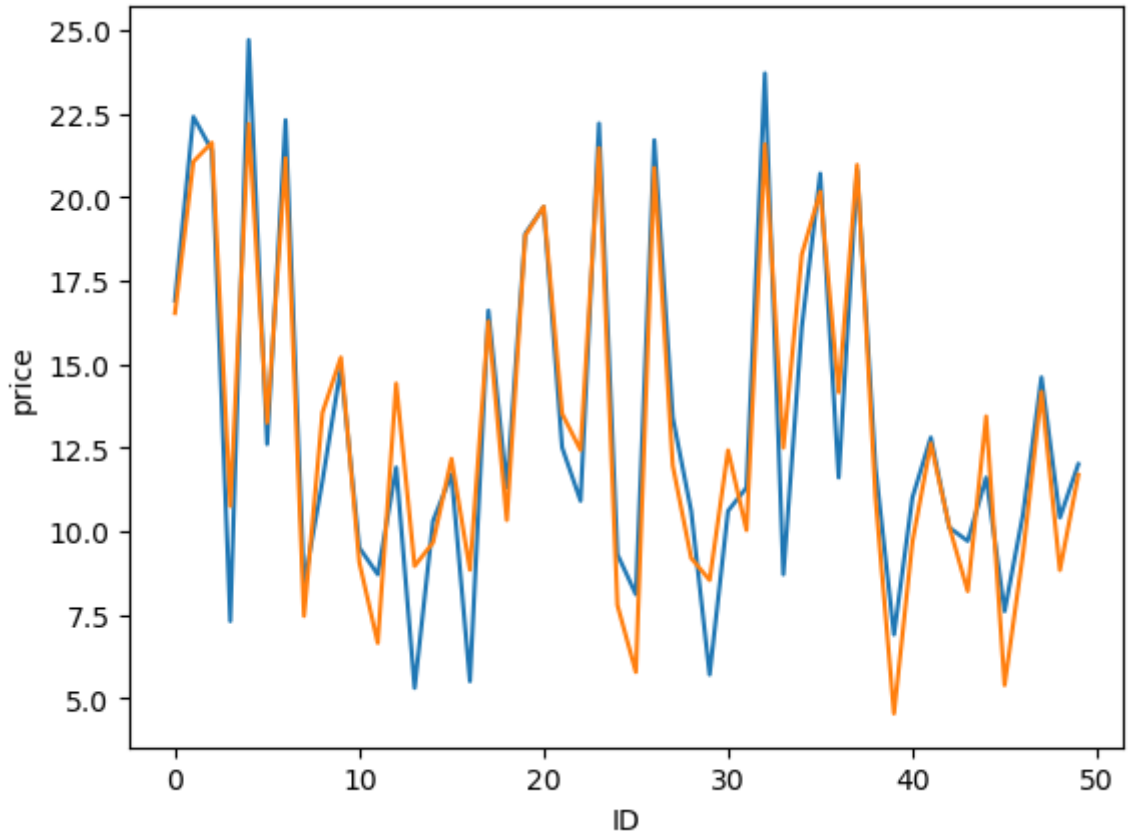
In [30]:
```
Results=pd.DataFrame(columns=['price','predicted'])
Results['price']=y_test
Results['predicted']=y_pred_lasso
Results=Results.reset_index()
Results['ID']=Results.index
Results.head(15)
```

Out[30]:

| | index | price | predicted | ID |
|---|---|---|---|---|
| **0** | 95 | 16.9 | 16.523920 | 0 |
| **1** | 15 | 22.4 | 21.058219 | 1 |
| **2** | 30 | 21.4 | 21.624966 | 2 |
| **3** | 158 | 7.3 | 10.745724 | 3 |
| **4** | 128 | 24.7 | 22.188269 | 4 |
| **5** | 115 | 12.6 | 13.243102 | 5 |
| **6** | 69 | 22.3 | 21.161155 | 6 |
| **7** | 170 | 8.4 | 7.454875 | 7 |
| **8** | 174 | 11.5 | 13.541765 | 8 |
| **9** | 45 | 14.9 | 15.197360 | 9 |
| **10** | 66 | 9.5 | 9.058959 | 10 |
| **11** | 182 | 8.7 | 6.647262 | 11 |
| **12** | 165 | 11.9 | 14.415342 | 12 |
| **13** | 78 | 5.3 | 8.949245 | 13 |
| **14** | 186 | 10.3 | 9.655571 | 14 |

In [31]:
```
import seaborn as sns
import matplotlib.pyplot as plt
sns.lineplot(x='ID',y='price',data=Results.head(50))
sns.lineplot(x='ID',y='predicted',data=Results.head(50))
plt.plot()
```

Out[31]: []



In [ ]: