In [1]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.linear_model import LinearRegression
from sklearn.linear_model import Lasso,RidgeCV,Ridge
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split
```

In [2]:

```
df=pd.read_csv(r"C:\Users\91950\Downloads\Advertising.csv")
df
```

Out[2]:

	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	12.0
3	151.5	41.3	58.5	16.5
4	180.8	10.8	58.4	17.9
...	...	...	...	...
195	38.2	3.7	13.8	7.6
196	94.2	4.9	8.1	14.0
197	177.0	9.3	6.4	14.8
198	283.6	42.0	66.2	25.5
199	232.1	8.6	8.7	18.4

200 rows × 4 columns

In [3]:

```
df.head()
```

Out[3]:

	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	12.0
3	151.5	41.3	58.5	16.5
4	180.8	10.8	58.4	17.9

In [4]:

```
df.tail()
```

Out[4]:

	TV	Radio	Newspaper	Sales
195	38.2	3.7	13.8	7.6
196	94.2	4.9	8.1	14.0
197	177.0	9.3	6.4	14.8
198	283.6	42.0	66.2	25.5
199	232.1	8.6	8.7	18.4

In [5]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 4 columns):
 #   Column     Non-Null Count  Dtype  
---  ------     --------------  -----  
 0   TV         200 non-null    float64
 1   Radio      200 non-null    float64
 2   Newspaper  200 non-null    float64
 3   Sales      200 non-null    float64
dtypes: float64(4)
memory usage: 6.4 KB
```

In [6]:

```
df.describe()
```

Out[6]:

	TV	Radio	Newspaper	Sales
count	200.000000	200.000000	200.000000	200.000000
mean	147.042500	23.264000	30.554000	15.130500
std	85.854236	14.846809	21.778621	5.283892
min	0.700000	0.000000	0.300000	1.600000
25%	74.375000	9.975000	12.750000	11.000000
50%	149.750000	22.900000	25.750000	16.000000
75%	218.825000	36.525000	45.100000	19.050000
max	296.400000	49.600000	114.000000	27.000000

In [7]:

```
df.isnull().sum()
```

Out[7]:

```
TV           0
Radio        0
Newspaper    0
Sales        0
dtype: int64
```

LINEAR REGRESSION

In [8]:

```
feature=df.columns[0:3]
target=df.columns[-1]
x=df[feature].values
y=df[target].values
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3,random_state=1)
regr=LinearRegression()
regr.fit(x_train,y_train)
print("Regresson: ",regr.score(x_test,y_test))
```

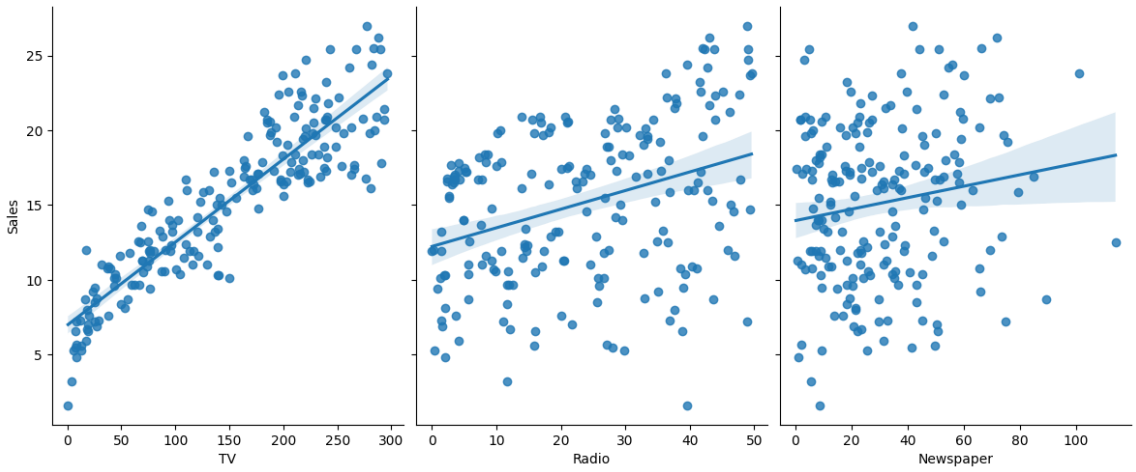
```
Regresson:  0.9071151423684273
```

In [9]:

```
y_pred=regr.predict(x_test)
sns.pairplot(df,x_vars=['TV','Radio','Newspaper'],y_vars=['Sales'],height=5,aspect=0.8,k
```

Out[9]:

```
<seaborn.axisgrid.PairGrid at 0x1c5a4090f90>
```



RIDGE REGRESSION

In [10]:

```
ridgeReg = Ridge(alpha=10)
ridgeReg.fit(x_train,y_train)
train_score_ridge = ridgeReg.score(x_train, y_train)
test_score_ridge = ridgeReg.score(x_test, y_test)
print('\nRidge Model\n')
print("the score of ridge method is {}".format(train_score_ridge))
print("the score of ridge method is {}".format(test_score_ridge))
```

```
Ridge Model

the score of ridge method is 0.8993745741098564
the score of ridge method is 0.9071080215617562
```

Comparission between ridge and linear regression

In [11]:

```
plt.figure(figsize=(10,10))
plt.plot(feature,ridgeReg.coef_,alpha=0.8,linestyle='none',marker='*',markersize=5,color
plt.plot(feature,regr.coef_,alpha=0.4,linestyle='none',marker='o',markersize=7,color='bl
plt.xticks(rotation=90)
plt.legend()
plt.title("Comparision b/w ridge and linear regression")
plt.show()
```

```
  Cell In[11], line 2
    plt.plot(feature,ridgeReg.coef_,alpha=0.8,linestyle='none',marker='*',
markersize=5,color='red',label=r'Ridge; $ \alpha

^
SyntaxError: unterminated string literal (detected at line 2)
```

Lasso regression

In [12]:

```
lasso = Lasso(alpha=10)
lasso.fit(x_train,y_train)
train_score_lasso=lasso.score(x_train,y_train)
test_score_lasso=lasso.score(x_test,y_test)
print('\n Lasso method\n')
print("the score of lasso method is {}".format(train_score_lasso))
print("the score of lasso method is {}".format(test_score_lasso))
```

```
 Lasso method

the score of lasso method is 0.8838659530099751
the score of lasso method is 0.8804750072676752
```

In [13]:

```
from sklearn.linear_model import LassoCV
lasso_cv = LassoCV(alphas=[0.001,0.001,0.01,0.1,1,10]).fit(x_train,y_train)
lasso_cv.fit(x_train,y_train)
print('\n Lasso method\n')
print("the score of lasso method is {}".format(lasso_cv.score(x_train,y_train)))
print("the score of lasso method is {}".format(lasso_cv.score(x_test,y_test)))
```

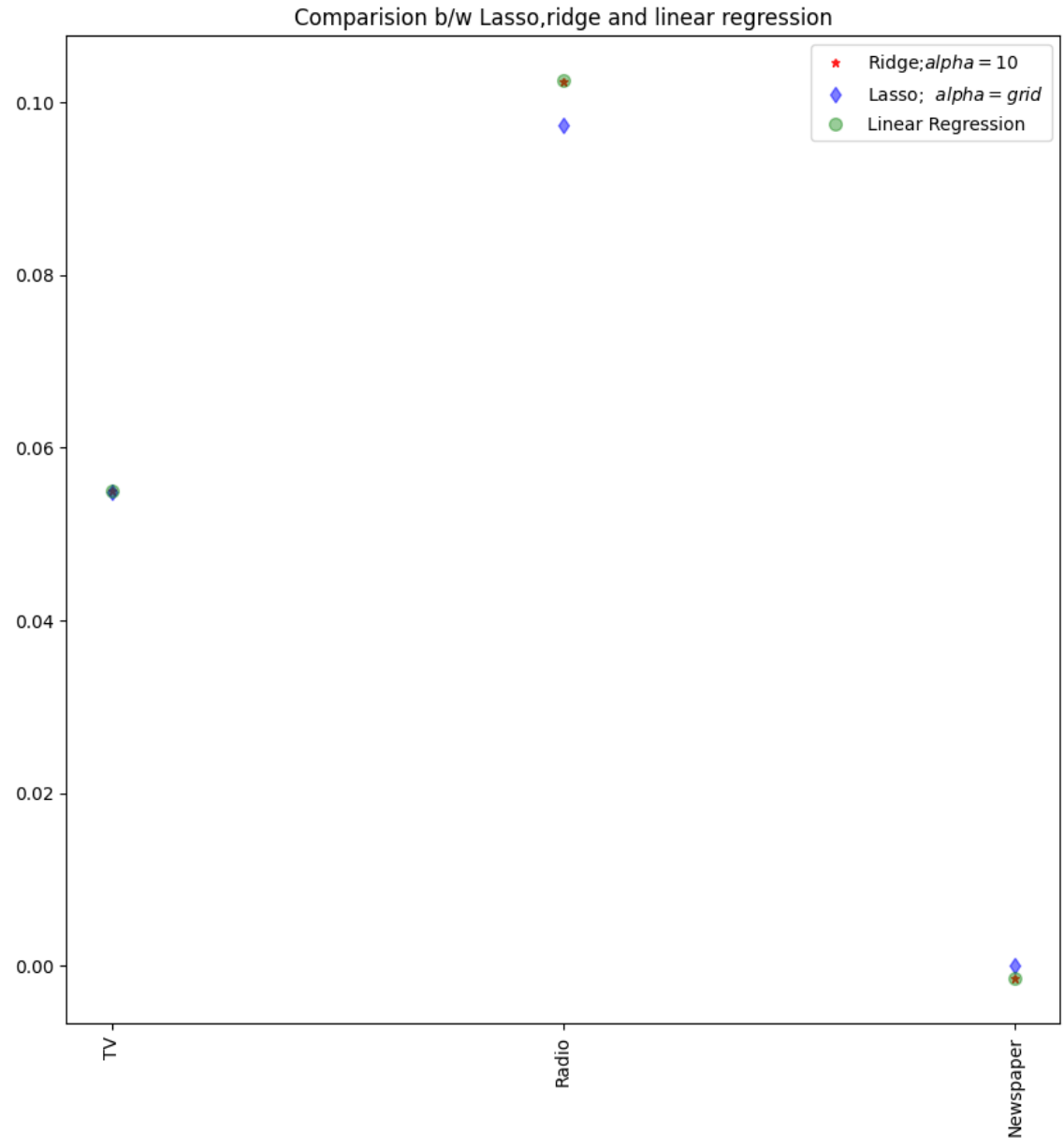
```
 Lasso method

the score of lasso method is 0.8991891680141245
the score of lasso method is 0.9059846692924887
```

Comparission between Lasso,Ridge and Linear Regression

In [19]:

```
plt.figure(figsize=(10,10))
plt.plot(feature,ridgeReg.coef_,alpha=0.8,linestyle='None',marker='*',markersize=5,color
plt.plot(lasso_cv.coef_,alpha=0.5,linestyle='None',marker='d',markersize=6,color='blue',
plt.plot(feature,regr.coef_,alpha=0.4,linestyle='None',marker='o',markersize=7,color='gr
plt.xticks(rotation=90)
plt.legend()
plt.title("Comparision b/w Lasso,ridge and linear regression")
plt.show()
```



In [20]:

```
ridge_cv = RidgeCV(alphas=[0.001,0.001,0.01,0.1,1,10]).fit(x_train,y_train)
print('\n Ridge method\n')
print("the score of ridge method is {}".format(ridge_cv.score(x_train,y_train)))
print("the score of ridge method is {}".format(ridge_cv.score(x_test,y_test)))
```

```
 Ridge method

the score of ridge method is 0.8993745741098556
the score of ridge method is 0.9071080215635791
```

In [ ]:

```
```