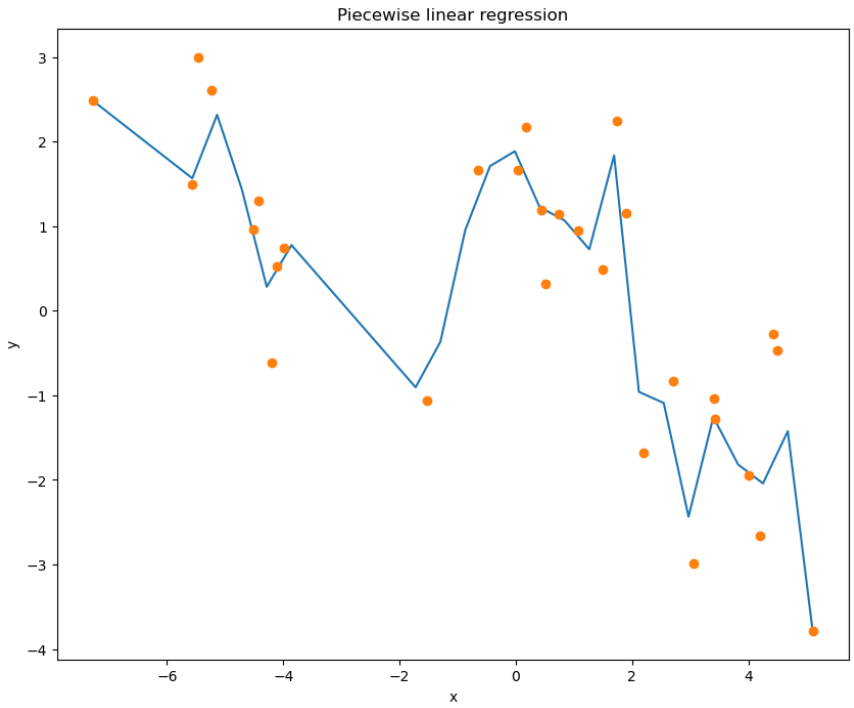
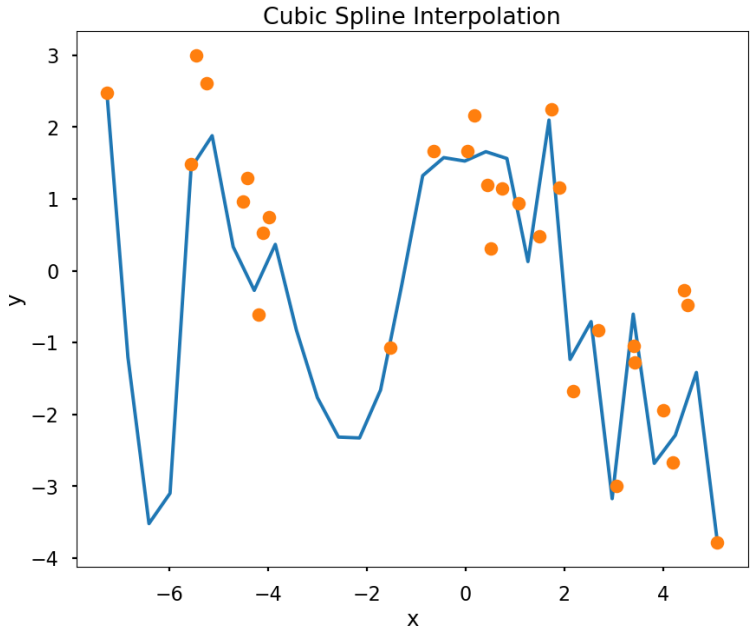
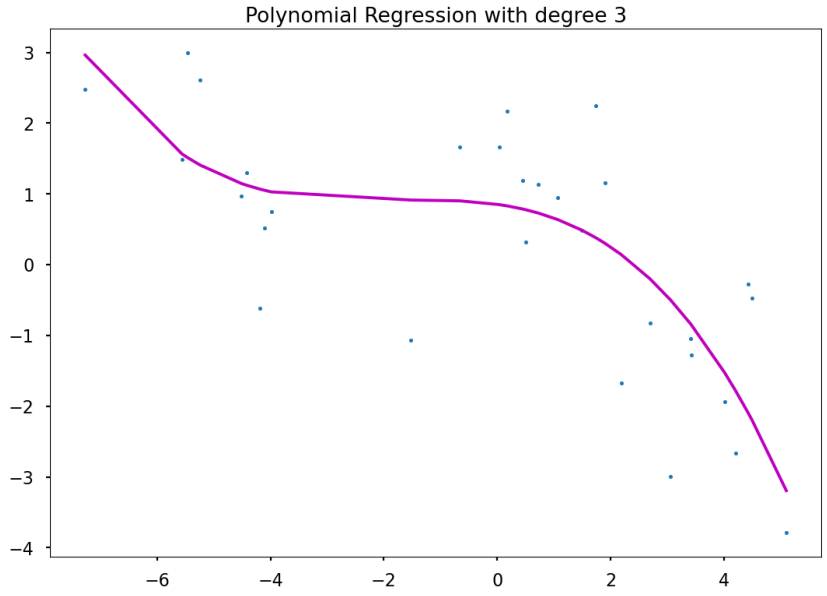


R^2: 0.37074975414979394
RMSE: 1.3625189783634482

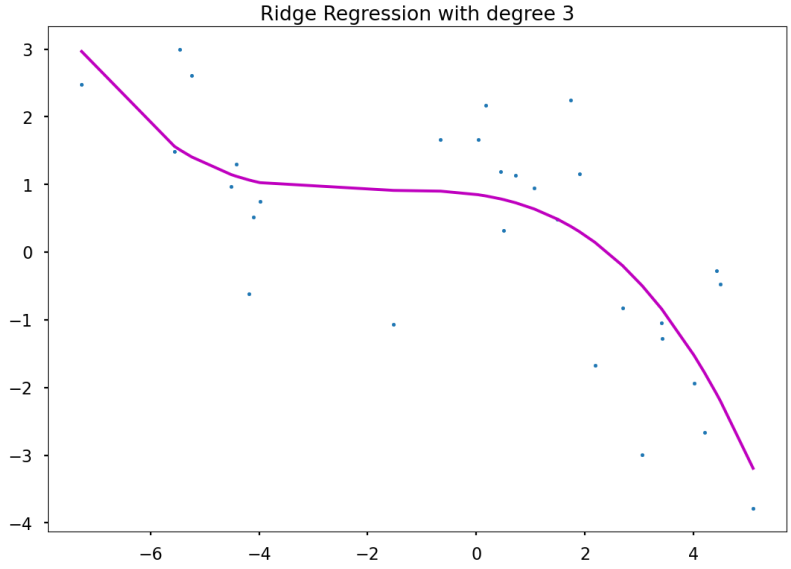


R^2 -0.9005474159660907
RMSE: 2.367937404672987

Piecewise polynomial regression results in negative R^2 for my data and high root mean squared value.

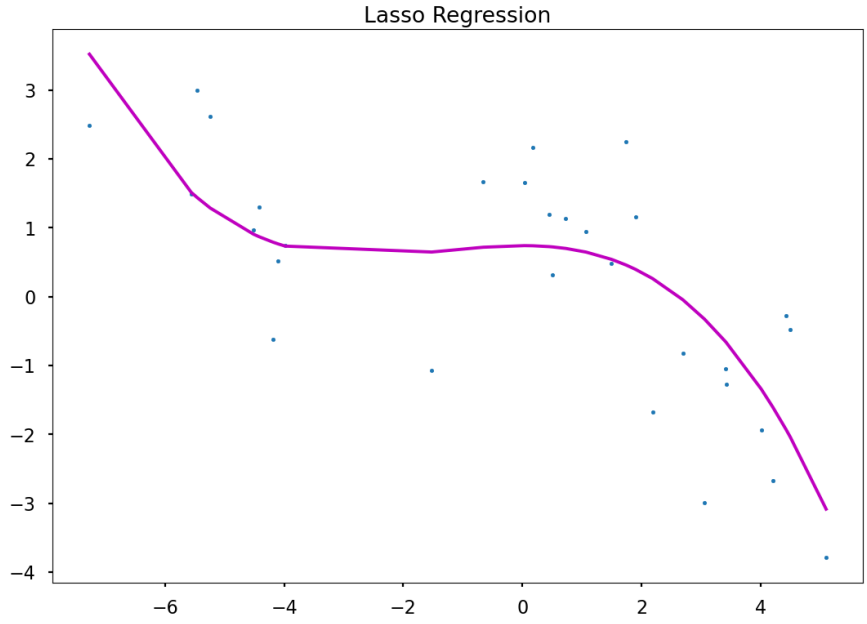


RMSE: 1.1060366152902406
R^2: 0.5853541887899862

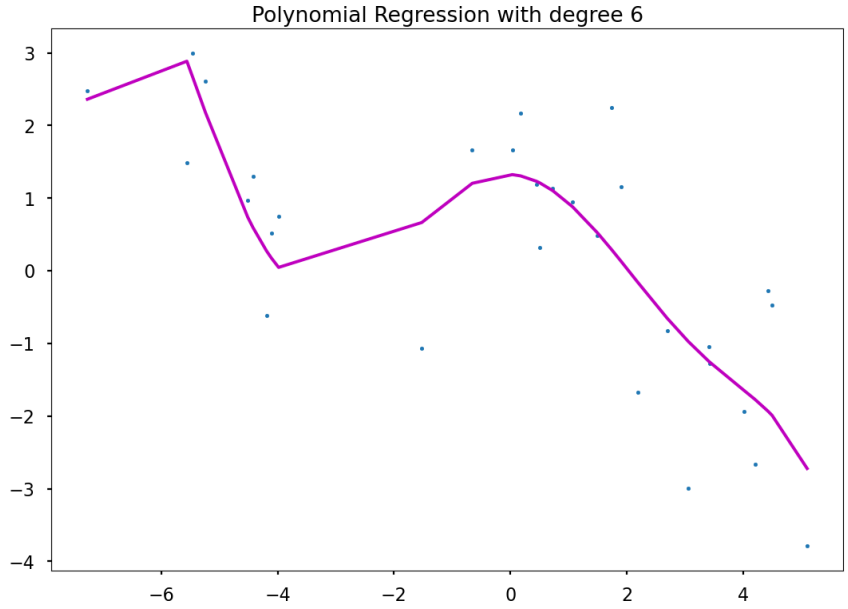


RMSE: 1.1060372624281316
R^2: 0.5853537035744145

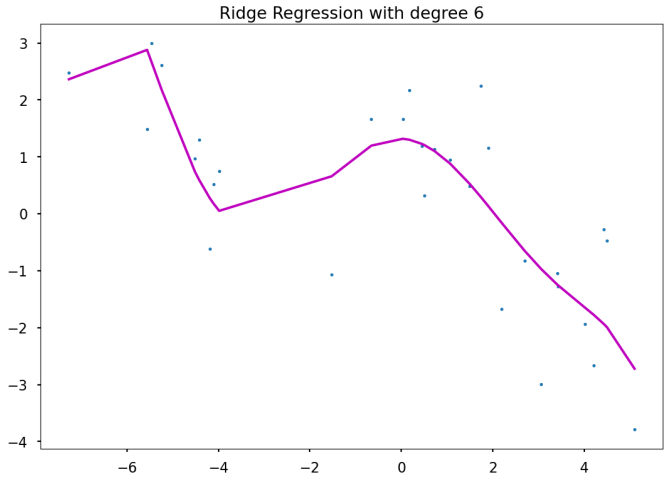
No difference between ridge regression and polynomial regression with degree 3.



RMSE: 1.1227078904454193
R^2: 0.5727600817975913

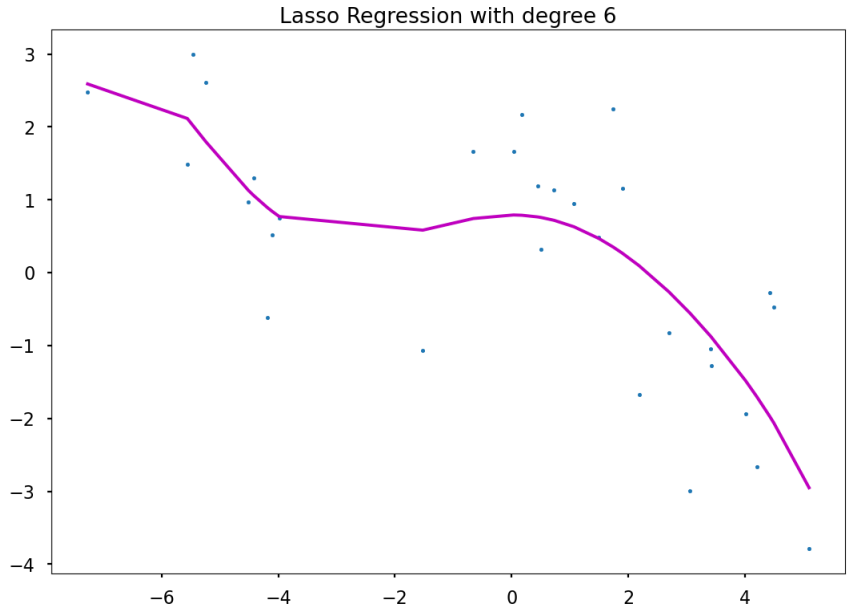


RMSE: 0.9569244249880072
R^2: 0.68962012551554

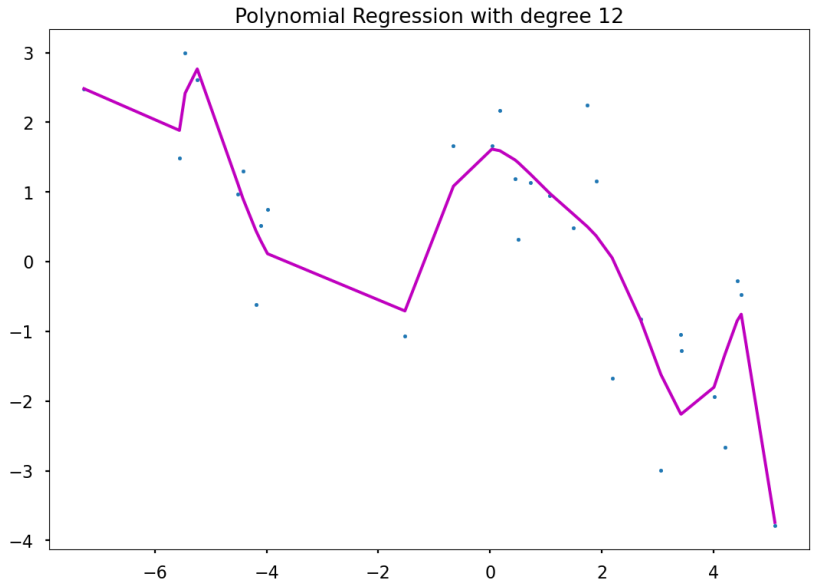


RMSE: 0.7607058329588232
R^2: 0.8038574730257876

Ridge regression performs better with sixth degree of polynomial feature in comparison to 3rd.

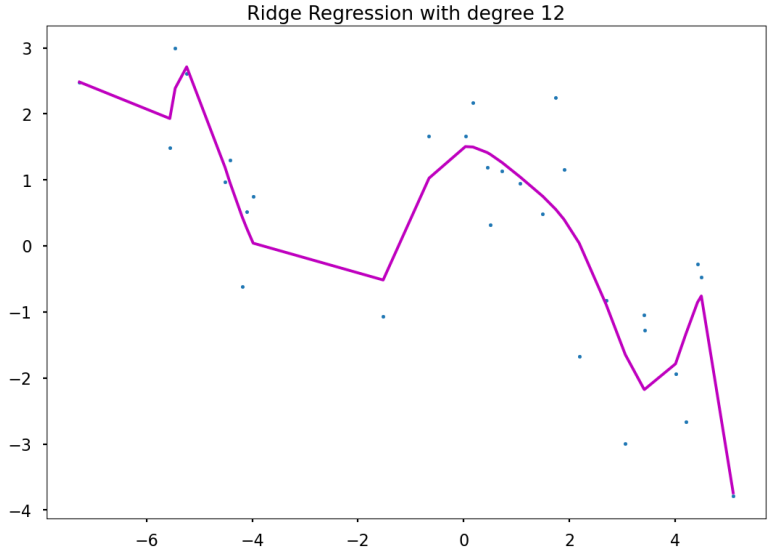


RMSE: 1.0424484451733995
R^2: 0.6316612200208955

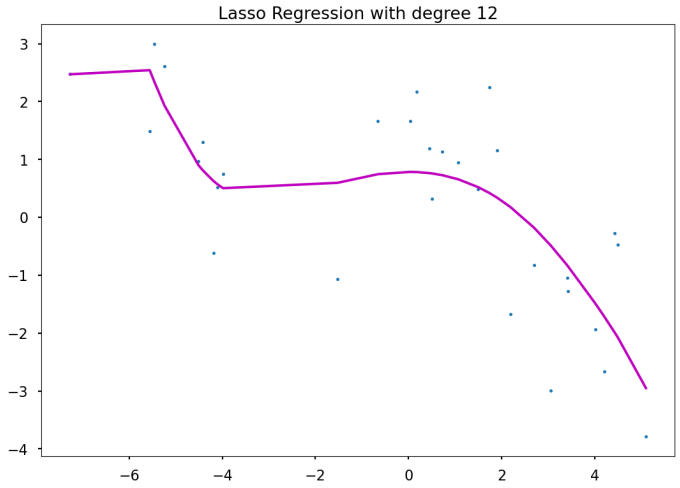


RMSE: 0.7584777205141658
R^2: 0.8050047958357075

As the degrees of polynomials increases both RMSE and R^2 improves.



RMSE: 0.7704885615246173
R^2: 0.7987802223318378



RMSE: 1.0356015376262735
R^2: 0.6364839031344398

Execution times:
For measuring the execution time of times I am generating 10 random points that follow a gaussian distribution with the same mean and covariance. Hence for reporting I am reporting the execution times of individual runs and the average time .

Then I am recording the execution times for each of the regression

Regression Type	Execution 1	Execution 2	Execution 3	Execution 4	Execution 5	Execution 6	Execution 7	Execution 8	Execution 9	Execution 10	Average time
Piecewise linear	0.140625	0.078125	0.078125	0.109375	0.09375	0.078125	0.09375	0.125	0.09375	0.09375	0.0984375
Piecewise polynomial	0.15625	0.09375	0.078125	0.109375	0.15625	0.09375	0.078125	0.078125	0.09375	0.09375	0.103125
Polynomial regression(degree 3)	0.09375	0.09375	0.046875	0.0625	0.046875	0.0625	0.0625	0.0625	0.046875	0.046875	0.0625
Ridge Regression(degree 3)	0.078125	0.078125	0.0625	0.0625	0.078125	0.0625	0.0625	0.0625	0.0625	0.09375	0.0703125
Lasso Regression(degree 3)	0.046875	0.078125	0.0625	0.0625	0.046875	0.0625	0.09375	0.0625	0.0625	0.0625	0.0640625
Polynomial regression(degree 8)	0.046875	0.0625	0.0625	0.109375	0.0625	0.046875	0.0625	0.0625	0.046875	0.046875	0.0609375

Ridge Regression(degree 8)	0.109375	0.0625	0.0625	0.046875	0.0625	0.0625	0.0625	0.078125	0.046875	0.0625	0.065625
Lasso Regression(degree 8)	0.046875	0.0625	0.0625	0.0625	0.0625	0.0625	0.0625	0.0625	0.109375	0.0625	0.065625
Polynomial regression(degree 12)	0.0625	0.0625	0.0625	0.078125	0.0625	0.09375	0.078125	0.0625	0.0625	0.0625	0.06875
Ridge Regression(degree 12)	0.078125	0.078125	0.078125	0.046875	0.078125	0.0625	0.0625	0.0625	0.0625	0.0625	0.0671875
Lasso regression(degree 12)	0.078125	0.0625	0.0625	0.0625	0.078125	0.0625	0.0625	0.078125	0.0625	0.0625	0.0671875
Polynomial regression(degree 20)	0.078125	0.0625	0.0625	0.046875	0.046875	0.0625	0.09375	0.078125	0.046875	0.0625	0.0640625
Ridge regression(degree 20)	0.078125	0.046875	0.0625	0.046875	0.09375	0.046875	0.0625	0.0625	0.0625	0.078125	0.0640625
Lasso regression (degree 20)	0.0625	0.109375	0.0625	0.0625	0.046875	0.0625	0.0625	0.046875	0.0625	0.0625	0.0640625

In my case the average execution times for piecewise linear regression and piecewise polynomial regression times are higher than single polynomial regression, ridge regression and lasso regression.