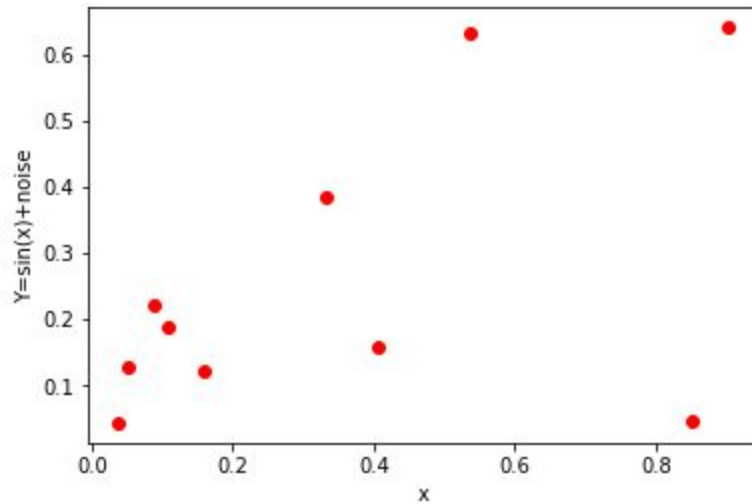


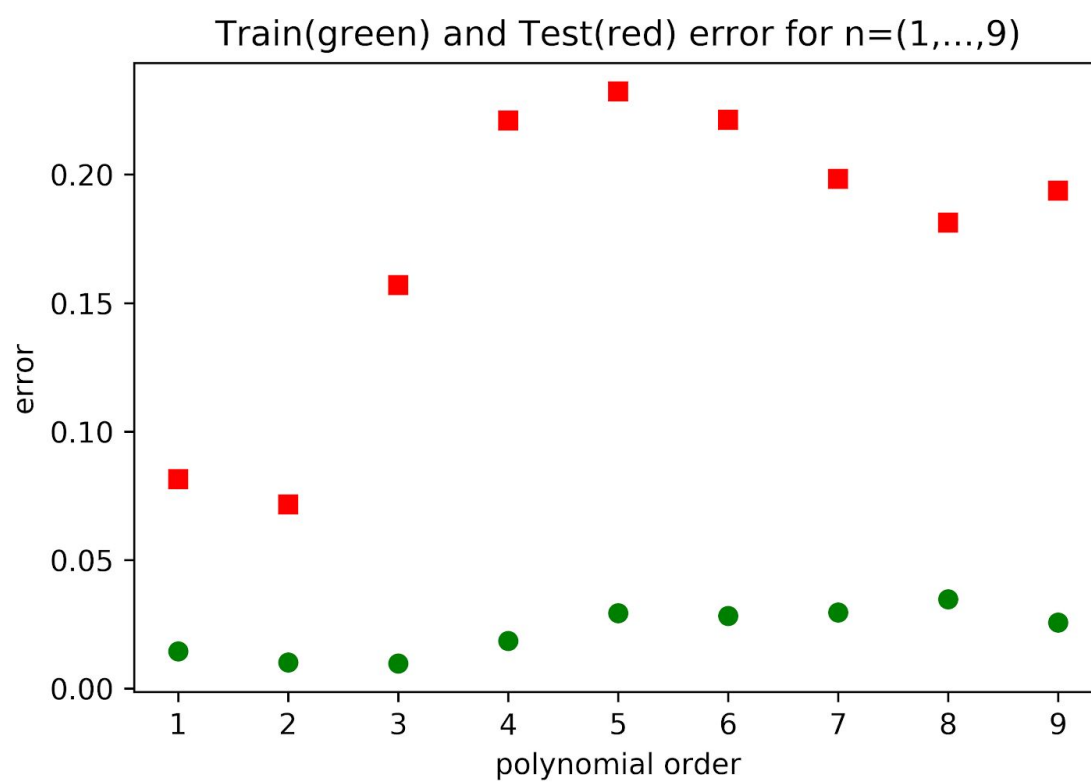
1) Overall minimum Train error is 0.014796719550949026 when $n = 3$ and iteration=2
Min test error: 0.02702310241885292

2.a) Synthetic data

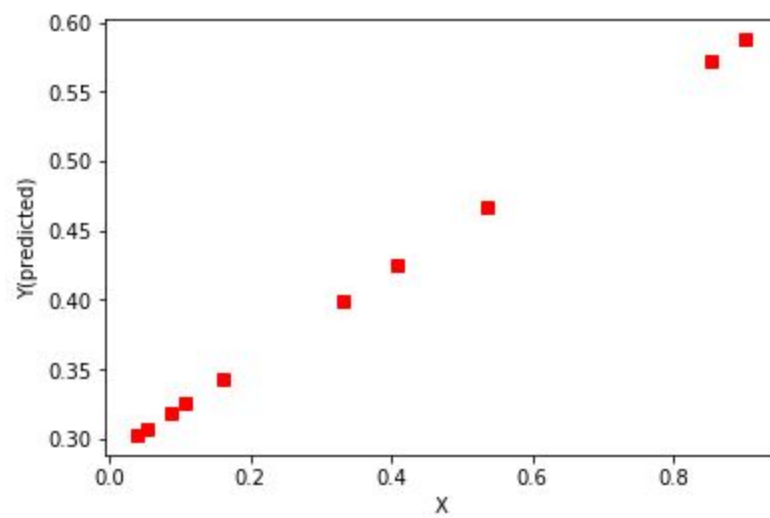


2.b) Overall minimum Train error 0.009760504930375 when $n = 3$ and iteration=10
Min test error: 0.15697535916176433

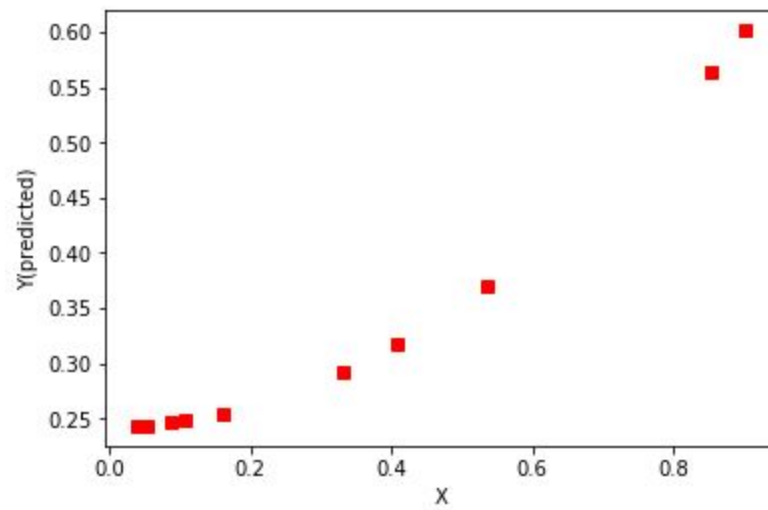
Below is the plot that depicts when $n=3$ the training error is smallest. For both $n=2$ and $n=3$ the curve is very close to actual synthetic data($\sin(x)+\text{noise}$), which resembles parabola or cubic polynomial for between 0 and 1, and hence it fits the data very well.



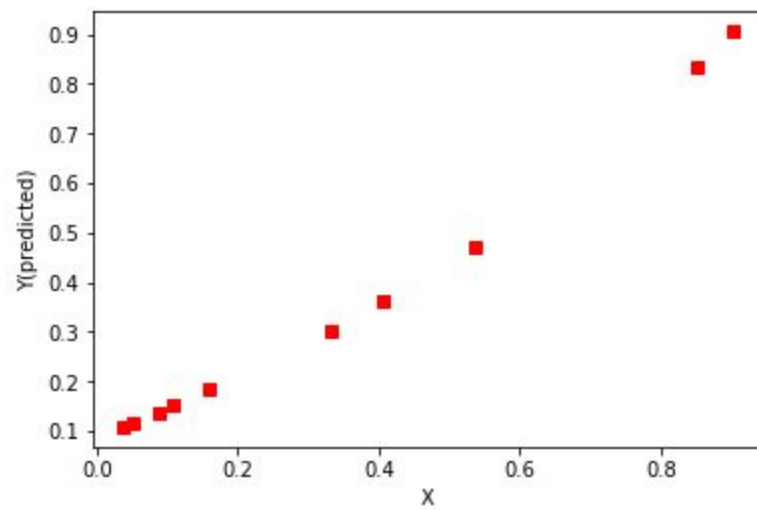
Plot for $n=1$



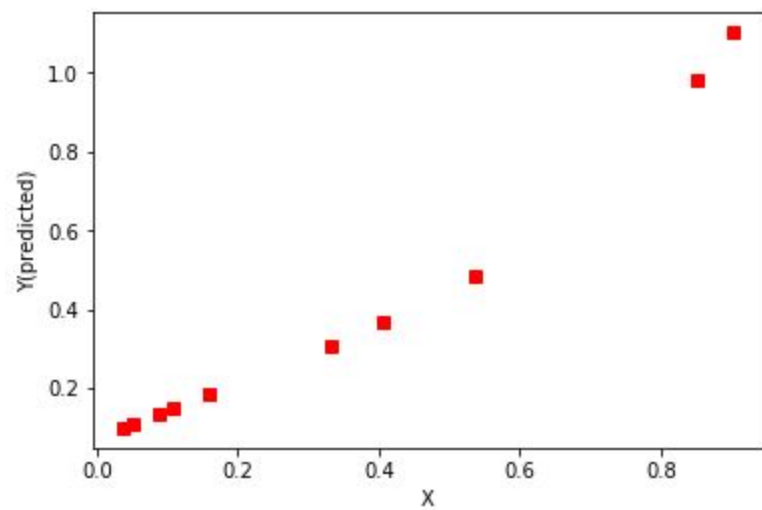
n=2



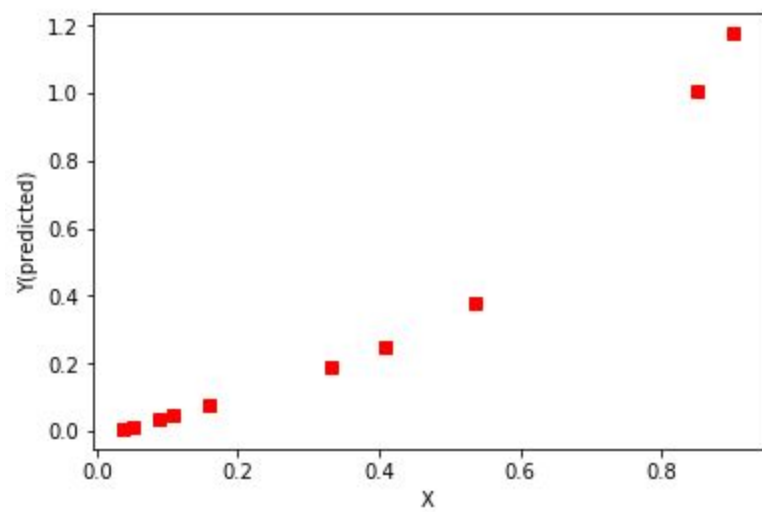
n=3



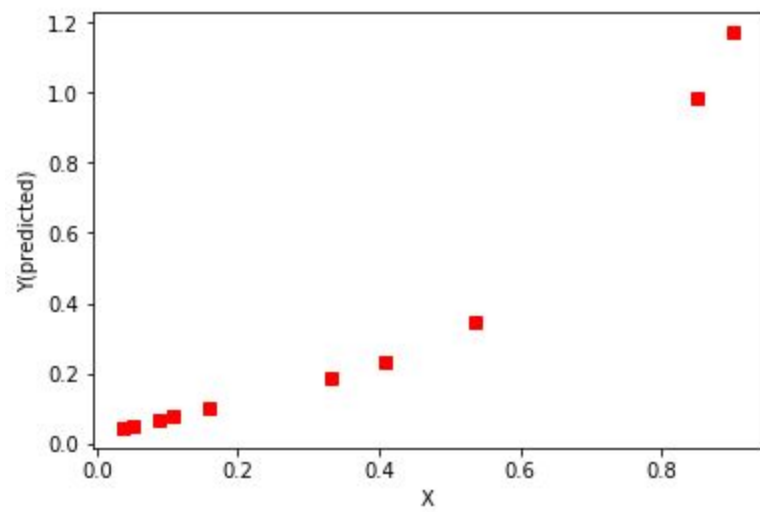
n=4



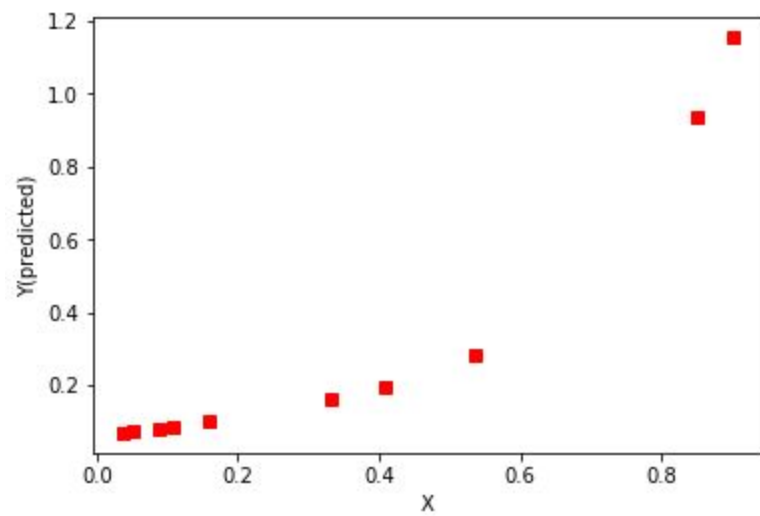
$n=5$



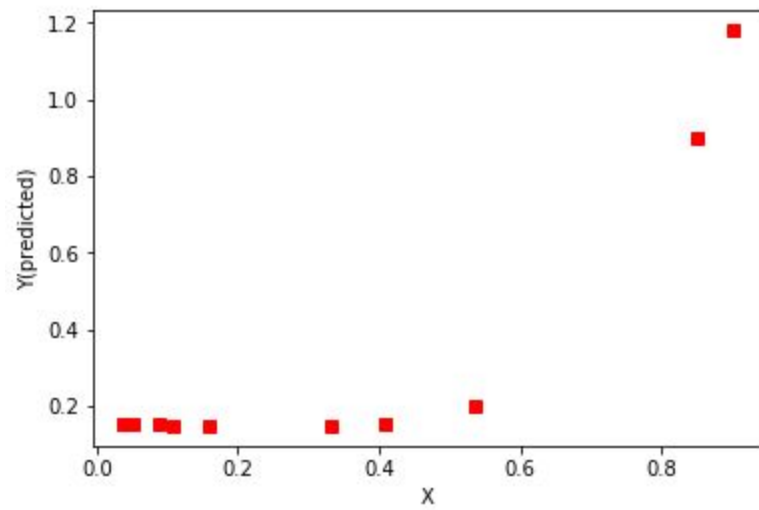
$n=6$



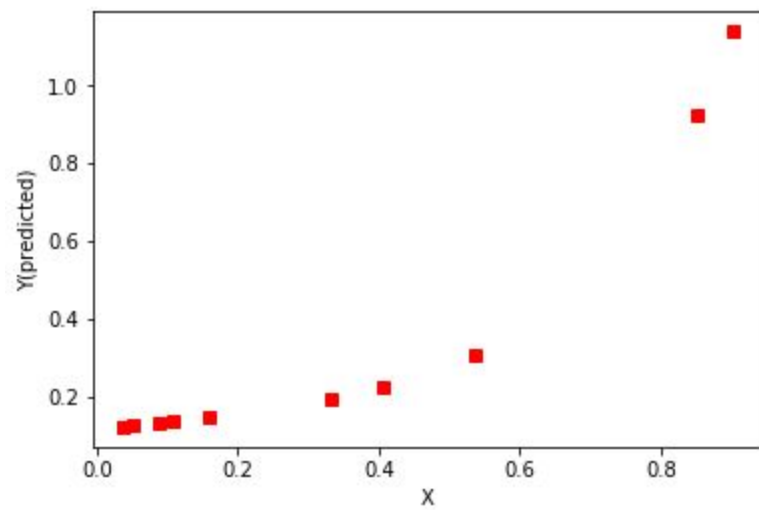
n=7



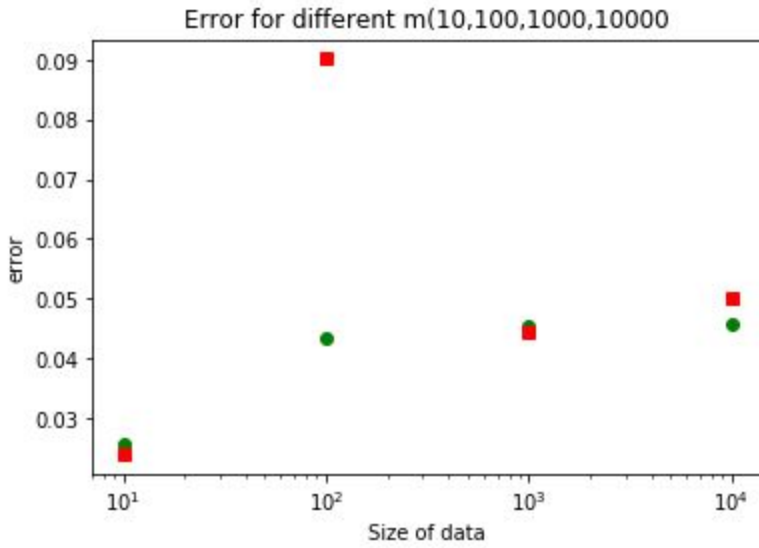
n=8



n=9



3) Training and test error varies when m changes(10,100,1000,10000)



4) For both the function 0.025 works best as it converges fast, with in 30 to 40 iteration, and provides best RMSE.

