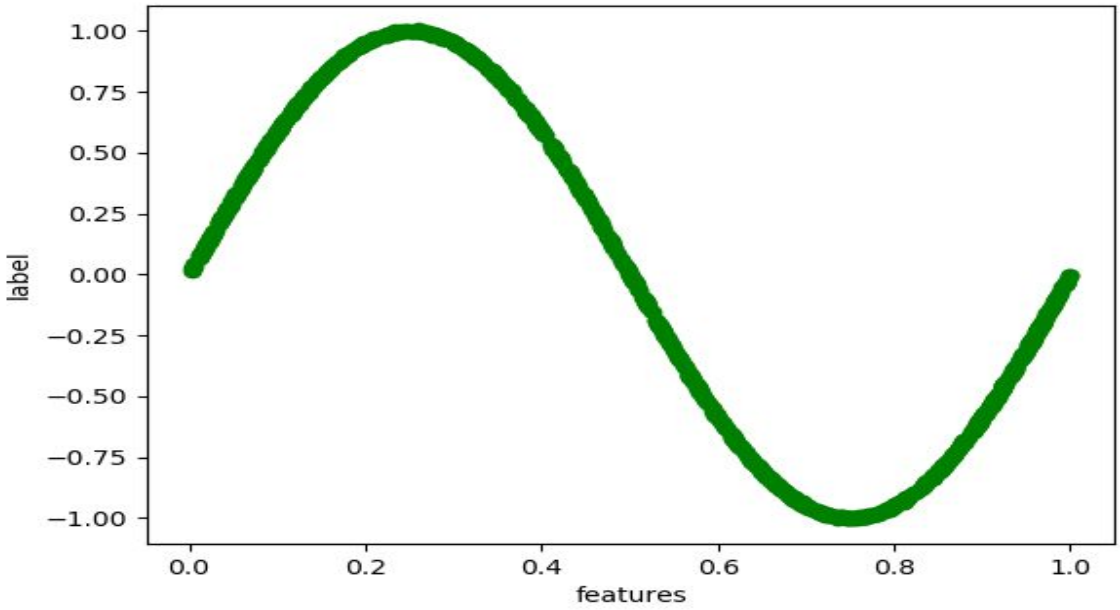
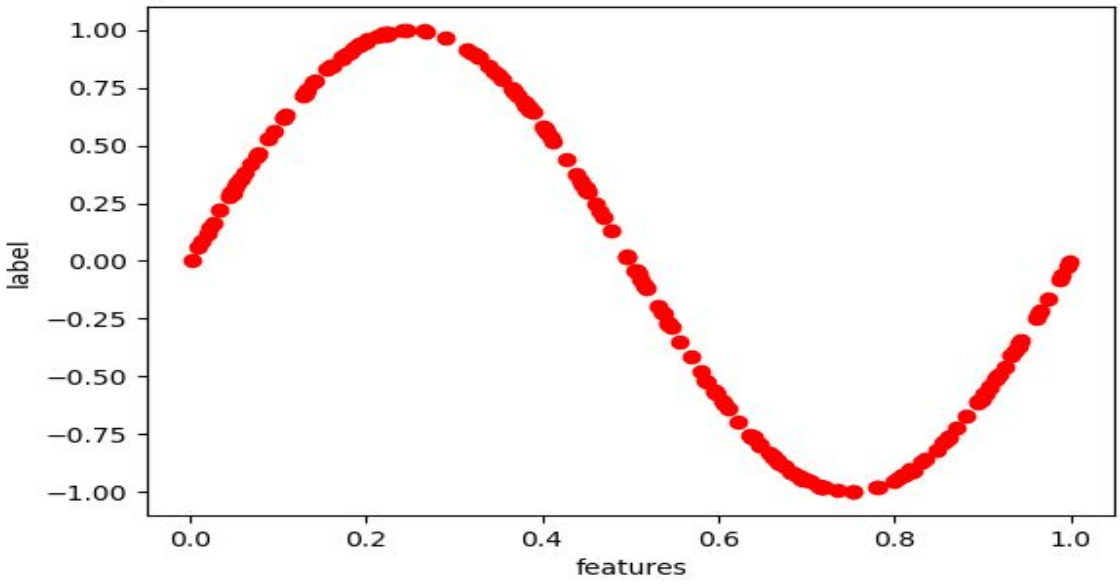
REPORT FOR PART-1 AND PART-2

Feature vs label graph for both the training data and the test data:

Training data :



Test data :



Values of Parameters,training error and test error :

Degree-1:

a[0]: 0.9192522178249645
a[1]: -1.8608044088861622
Train error = [0.0996791]
Test error = [0.09556384]

Degree-2 :

a[0]: 0.8644275690838014
a[1]: -1.582061950882869
a[2]: -0.25191713382599773
Train error = [0.0995198]
Test error = [0.09548911]

Degree-3:

a[0]: 0.9713812049236115
a[1]: -1.8078998005643232
a[2]: -1.2514501152687927
a[3]: 1.3362324565456554
Train error = [0.08861233]
Test error = [0.08657]

Degree-4:

a[0]: 1.006925258180763
a[1]: -1.5452521077605086
a[2]: -1.9427766837568108
a[3]: -0.028403391396930856
a[4]: 2.016243387610057
Train error = [0.07189233]
Test error = [0.07261383]

Degree-5:

a[0]: 0.9816412
a[1]:-1.138961
a[2]: -2.196857
a[3]: -0.853977

a[4]: 0.7896503
a[5]: 2.1595213
Train error : 0.05707761
Test error : 0.05918206

Degree-6:

a[0]: 0.9368317226067275
a[1]: -0.7892823871357358
a[2]: -2.213913563452902
a[3]: -1.2723028645605177
a[4]: 0.05207627447664789
a[5]: 1.188176231023191
a[6]: 2.044080255296642
Train error = [0.0465635]
Test error = [0.049099]

Degree-7:

a[0]: 0.8935958907263424
a[1]: -0.5422868331030584
a[2]: -2.134539209524694
a[3]: -1.4494455679374618
a[4]: -0.3574988836581427
a[5]: 0.5926198089524141
a[6]: 1.3068133515200693
a[7]: 1.8115253957874493
Train error = [0.04045373]
Test error = [0.04301591]

Degree-8:

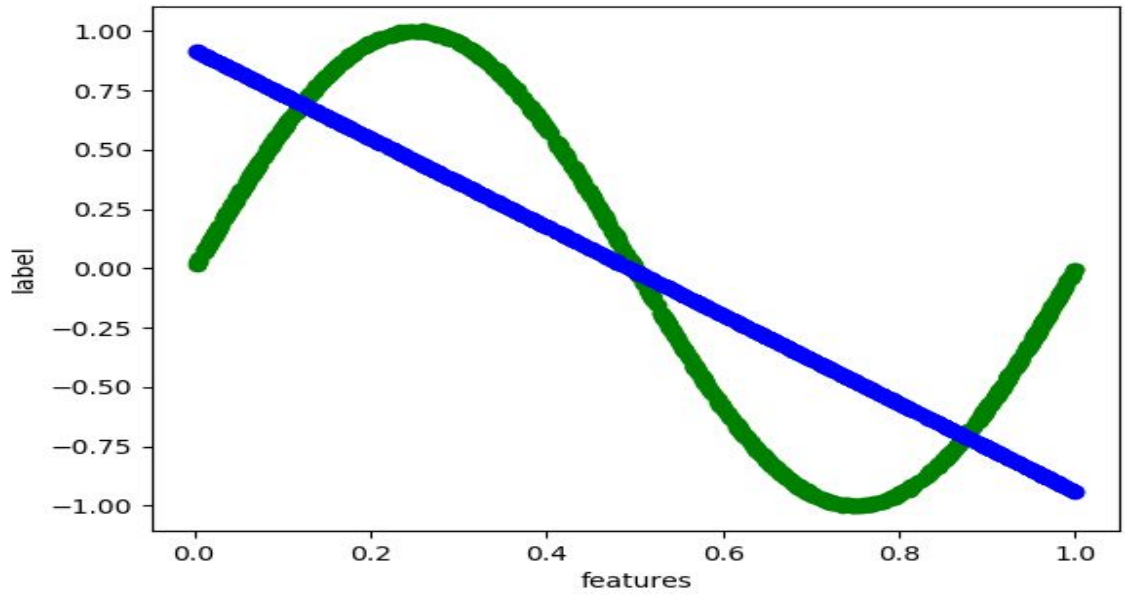
a[0]: 0.8591689897233387
a[1]: -0.388104564324559
a[2]: -2.03023230144614
a[3]: -1.4970842702173532
a[4]: -0.5651804068320927
a[5]: 0.24532800770637855
a[6]: 0.845813561405877
a[7]: 1.260896245974865
a[8]: 1.5349265030900396
Train error = [0.03773837]
Test error = [0.0402242]

Degree-9:

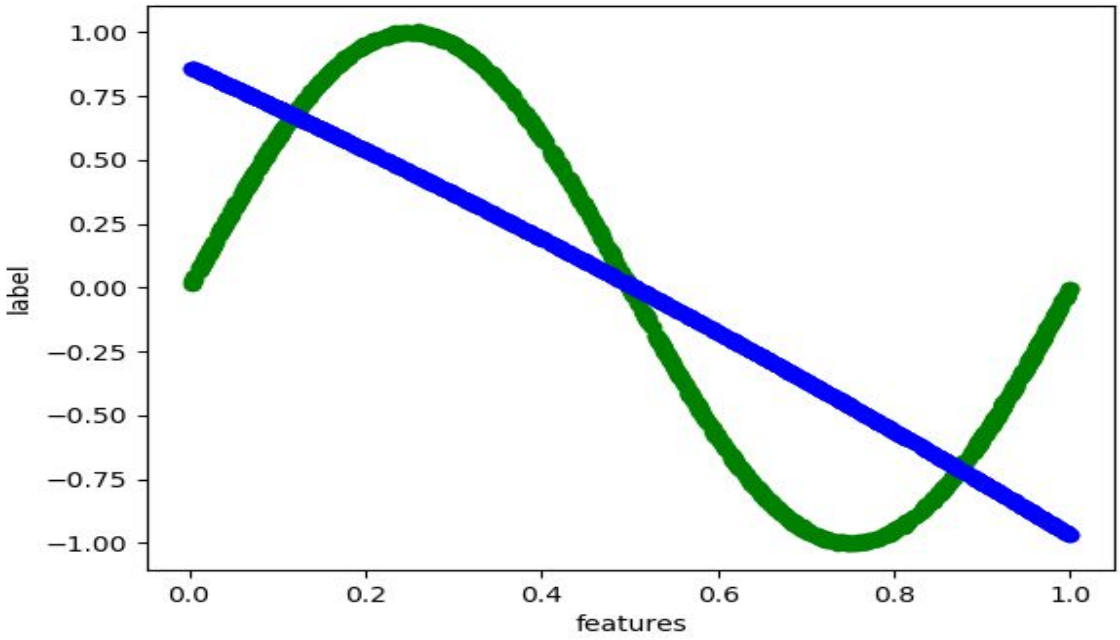
a[0]: 0.83473249
a[1]: -0.3040015
a[2]: -1.9329786
a[3]: -1.4814632
a[4]: -0.6544503
a[5]: 0.05576859
a[6]: 0.56925804
a[7]: 0.91209097
a[8]: 1.12751491
a[9]: 1.25324641
train error :0.03718263
test error : 0.03960912

Plots of all 9 different curves that fit the training dataset:

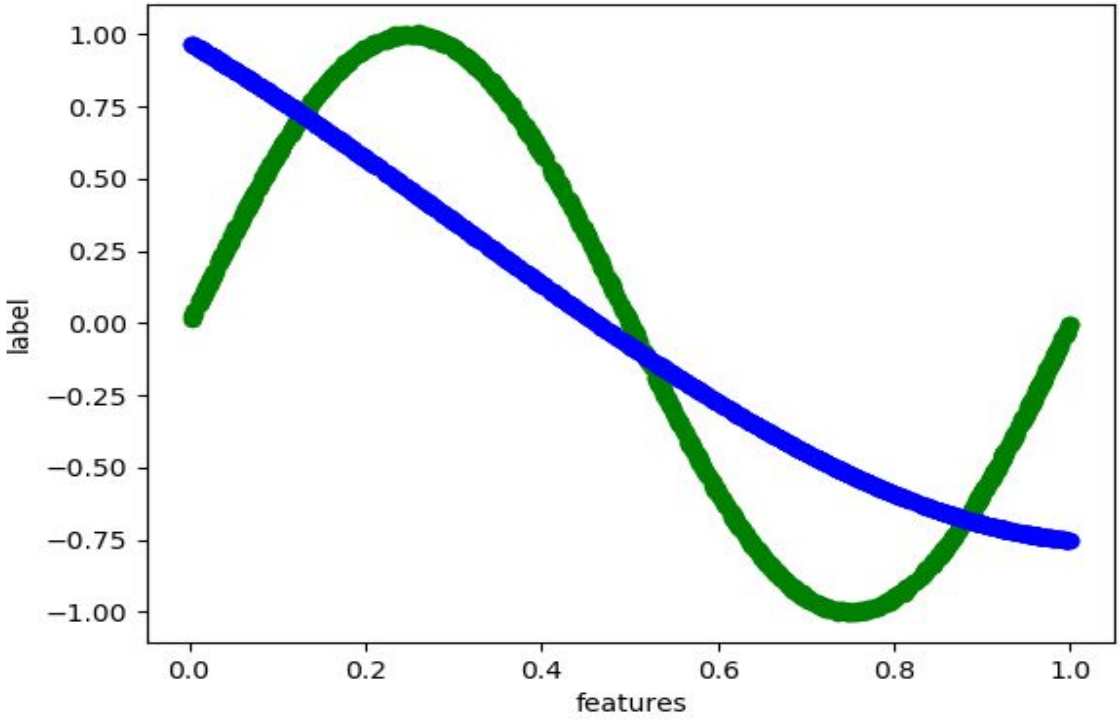
Degree 1:



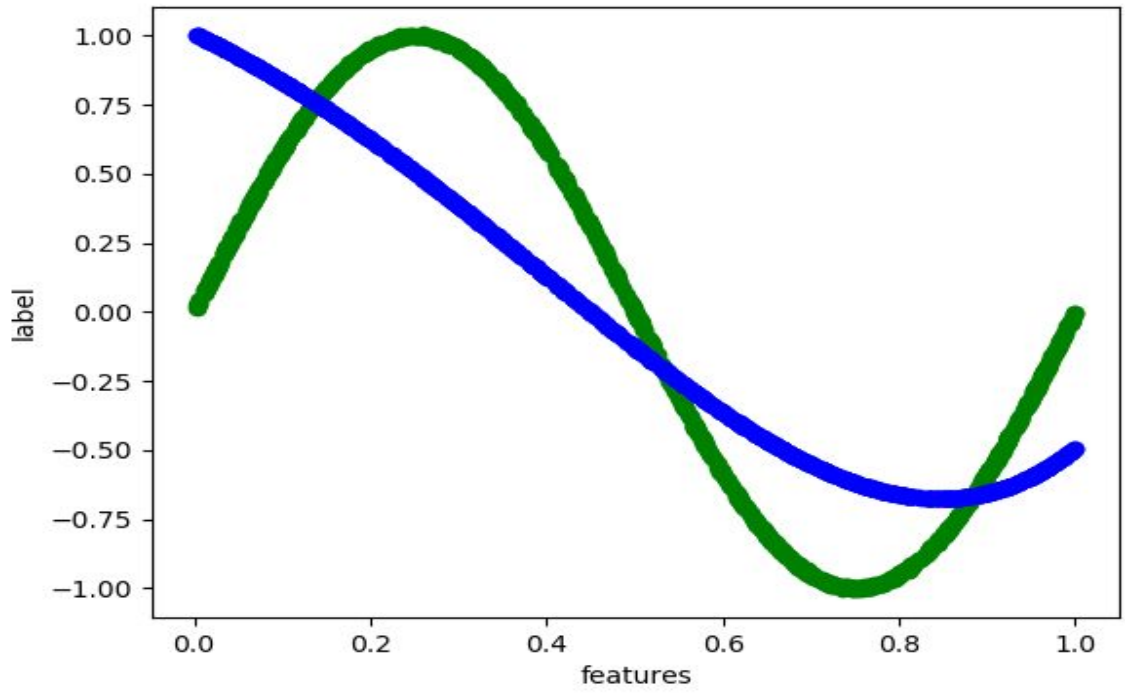
Degree 2:



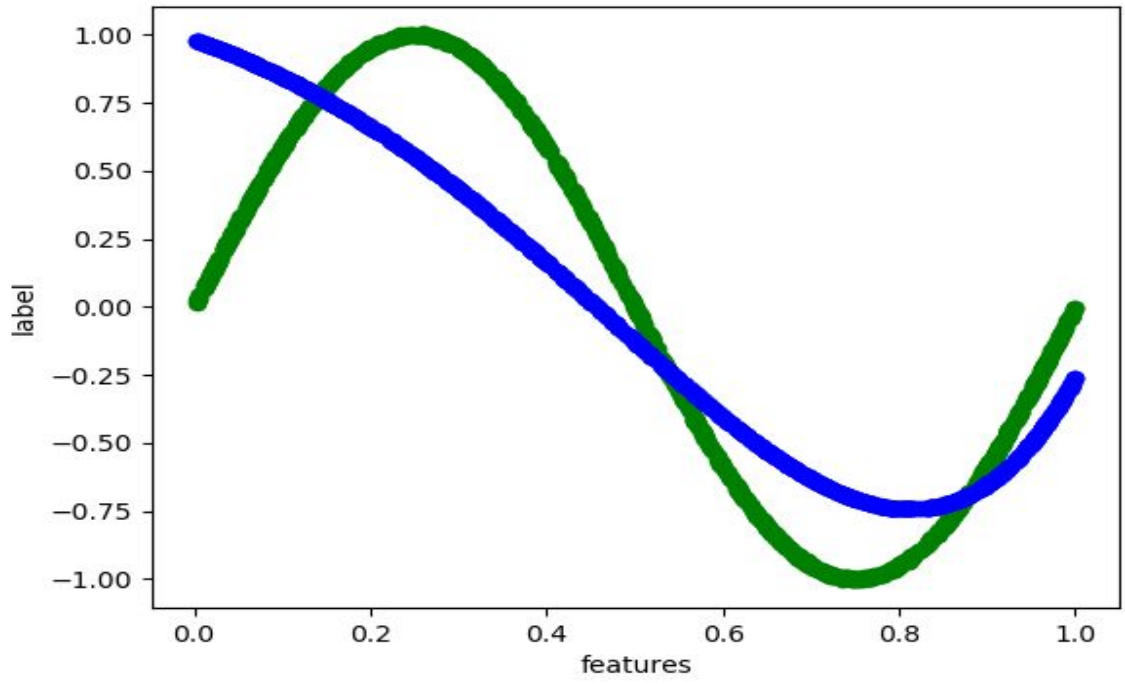
Degree 3:



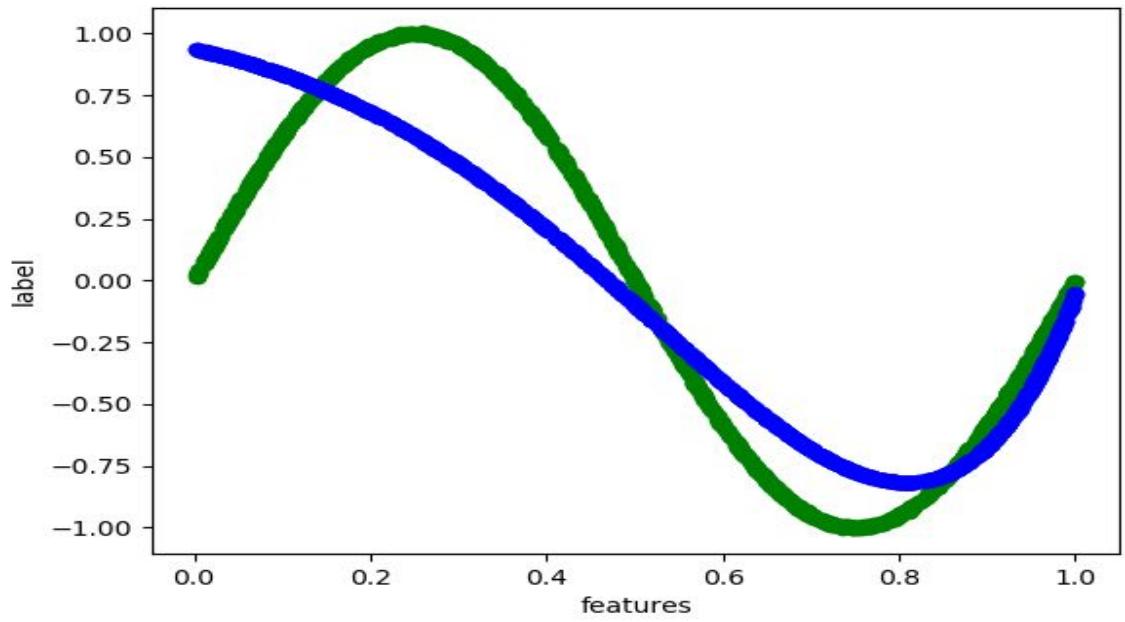
Degree 4:



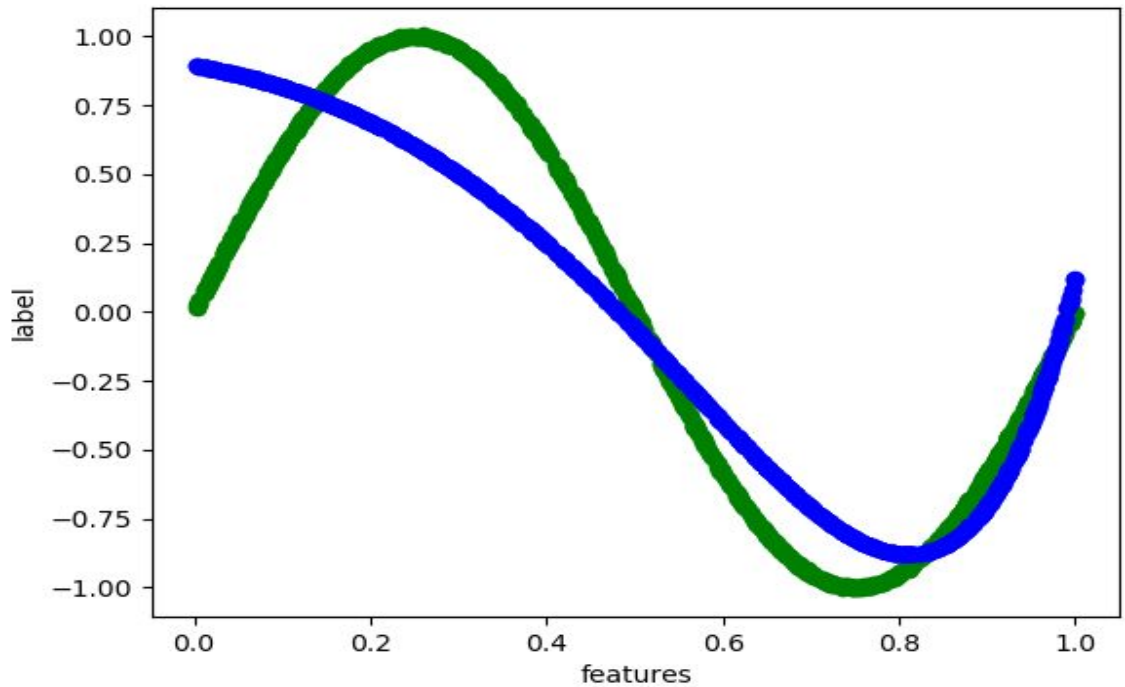
Degree 5:



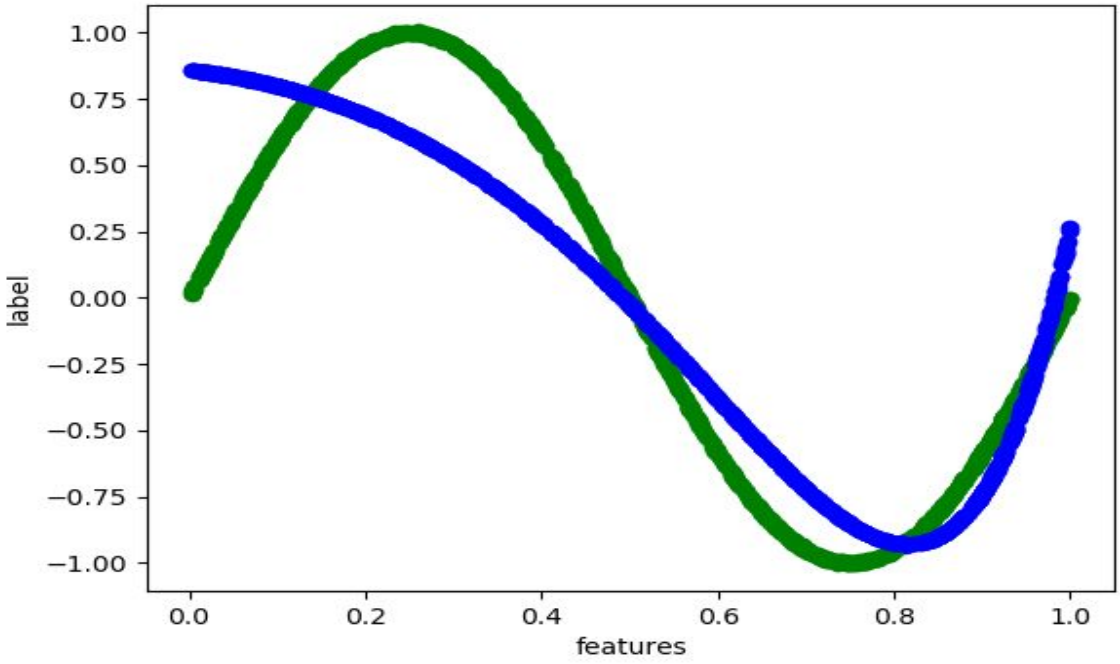
Degree 6:



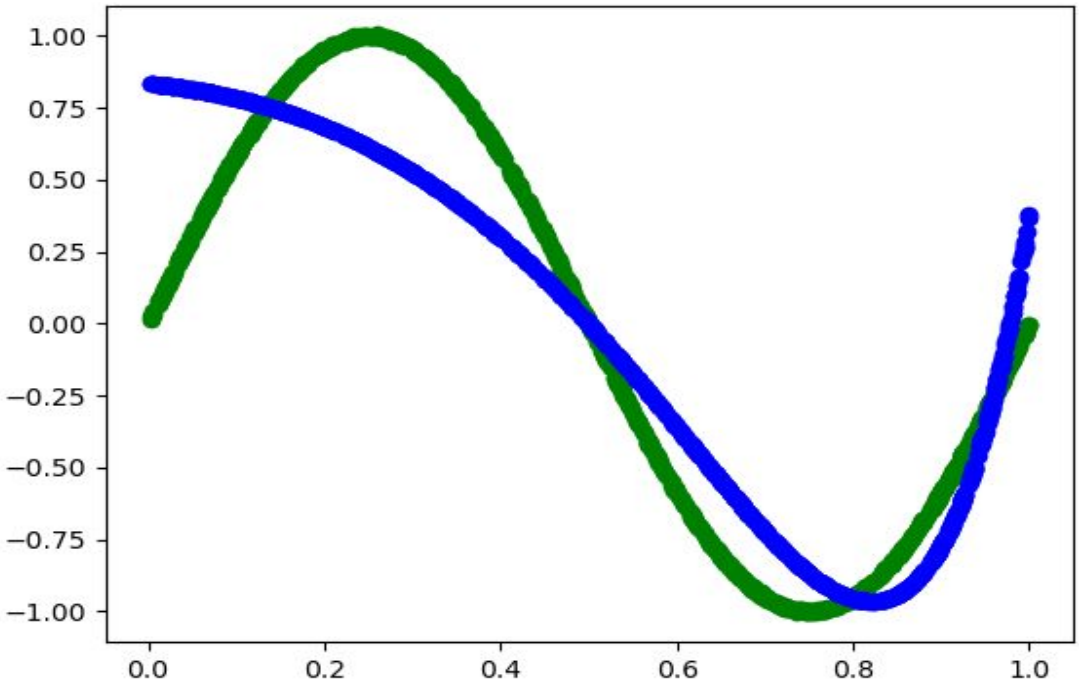
Degree 7:



Degree 8:

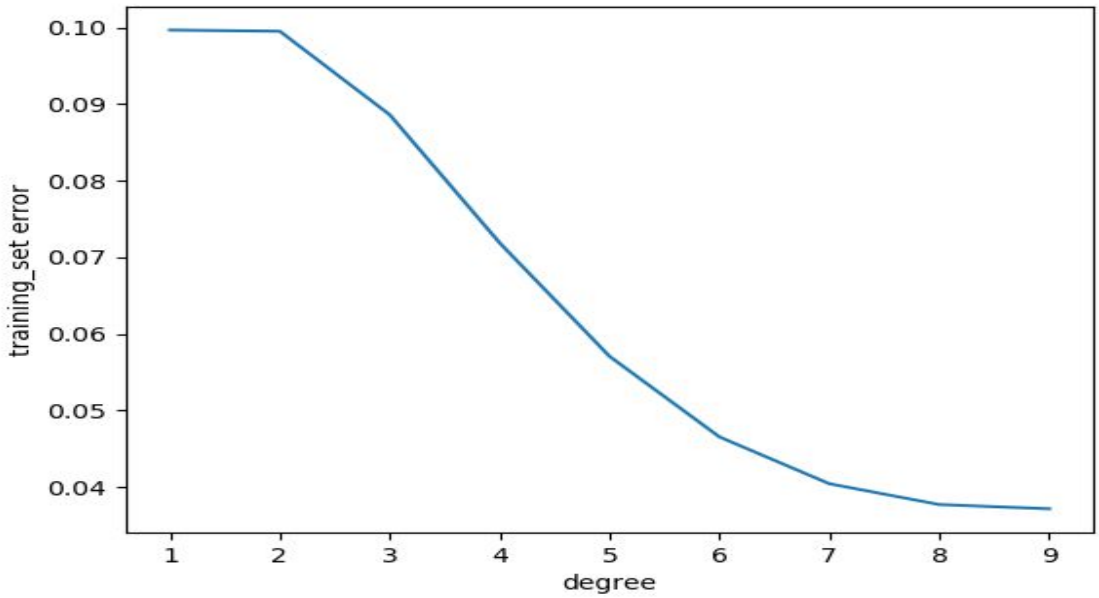


Degree 9:

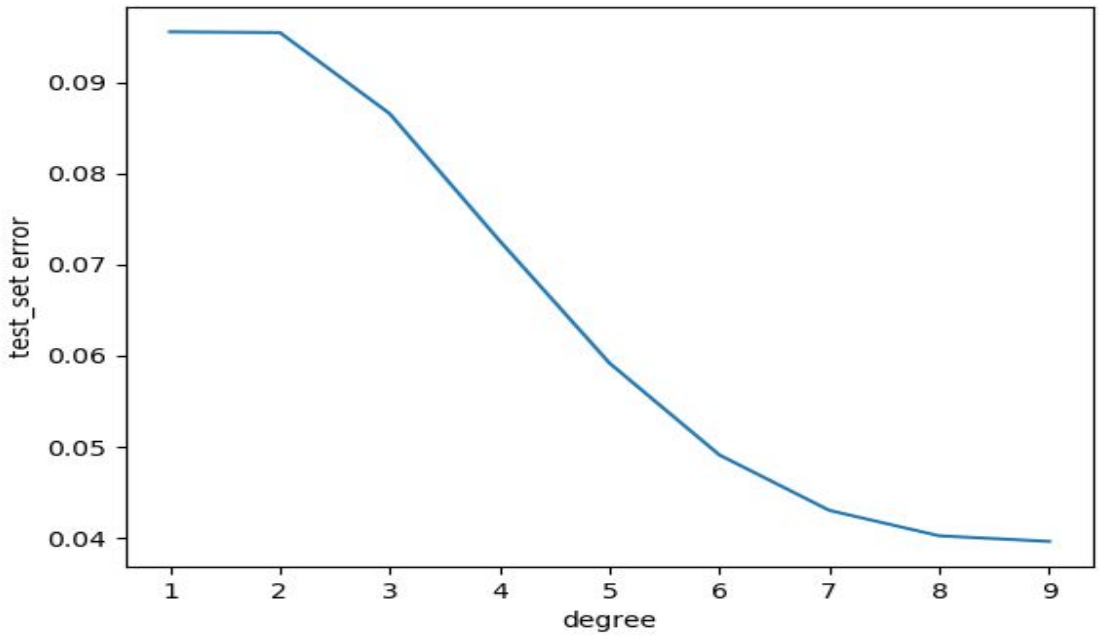


plot of training error and test error vs degree:

Training error :



Test error :



Difference between train error and test error:

For degree 1: 0.0041152600000000095,
For degree 2: 0.0040306900000000034,
For degree 3: 0.002042330000000009,
For degree 4: -0.0007214999999999999,
For degree 5: -0.0021044500000000008,
For degree 6: -0.002535499999999996,
For degree 7: -0.0025621799999999972,
For degree 8: -0.0024858300000000014,
For degree 9: -0.0024264899999999964

By observing the difference in the errors, we can say that we got less difference when we use degree 4 i.e ‘n’ value is 4.so,n value of 4 is suitable for the dataset we have.