Hw 2 CS 3200
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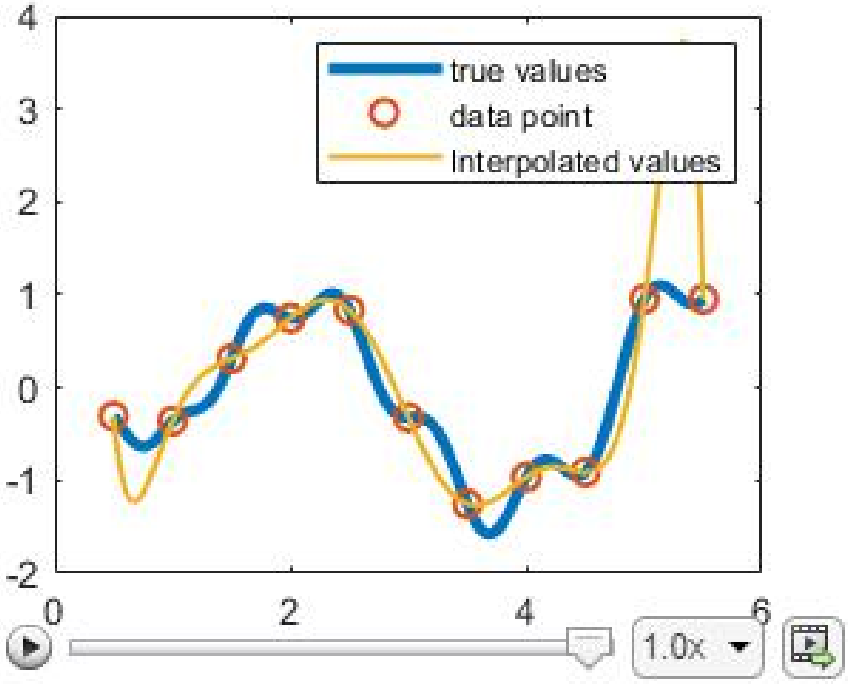
Q1



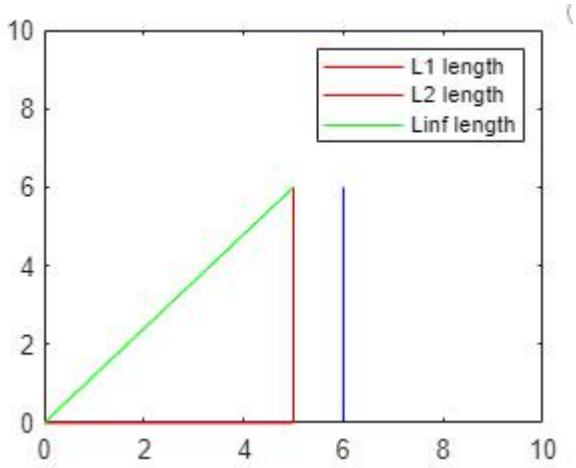
The approximation cannot always get the exact graph we want, always contain some erros. By increasing the n, my conclusion is we can increse the possibility to get the graph we need with less error. By decreasing the n, we have very big chance to get huge result gap(the graph is not preciece.). After all, as the n get larger, we will get less error for predicting the graph, but it always contain fault area.

O(n^3) for Vandermonde interpolation

O(n^2) for Lagrange Interpolation

O(n) for Barycentric Interpolaion

Q2

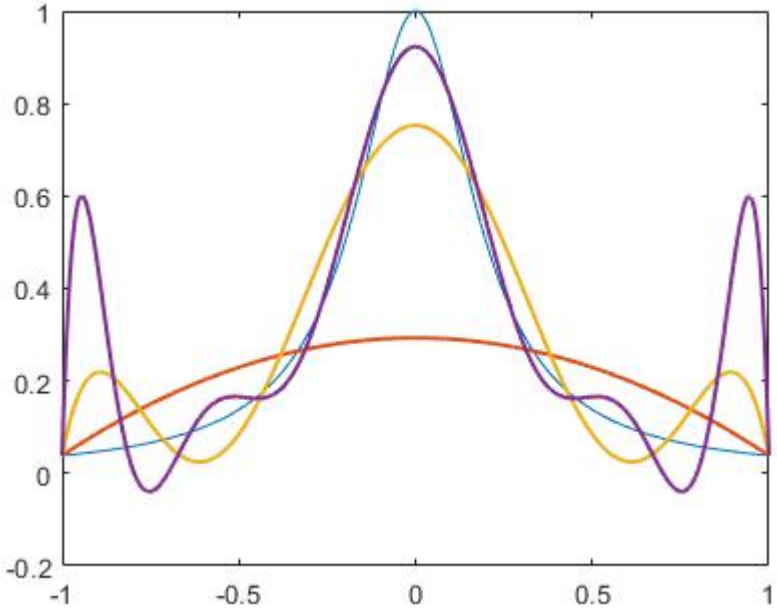


L1 is the largest in all the case.

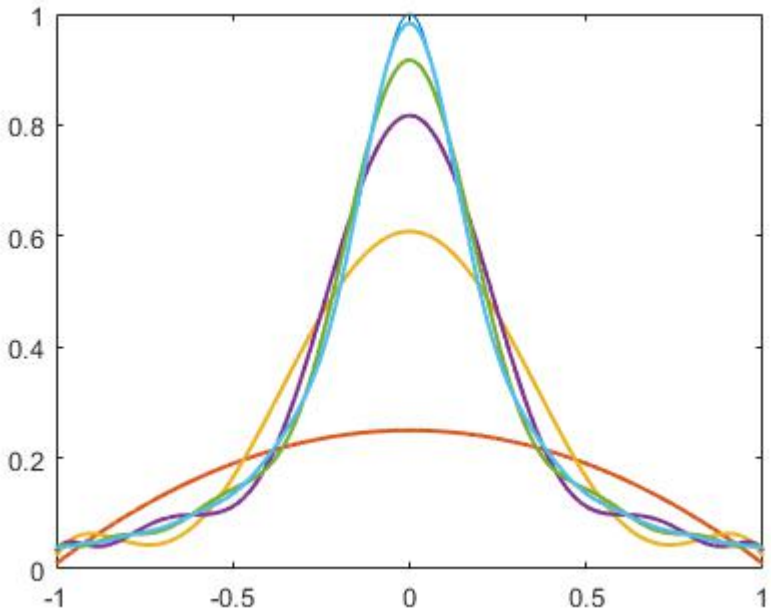
As p increse,the value of it decrease

Q3

```
n = 4
L1 = 313.15135
L2 = 10.90573
Linf = 0.70701
n = 8
L1 = 171.04453
L2 = 4.60434
Linf = 0.24736
n = 12
L1 = 181.26587
L2 = 7.34379
Linf = 0.55676
```



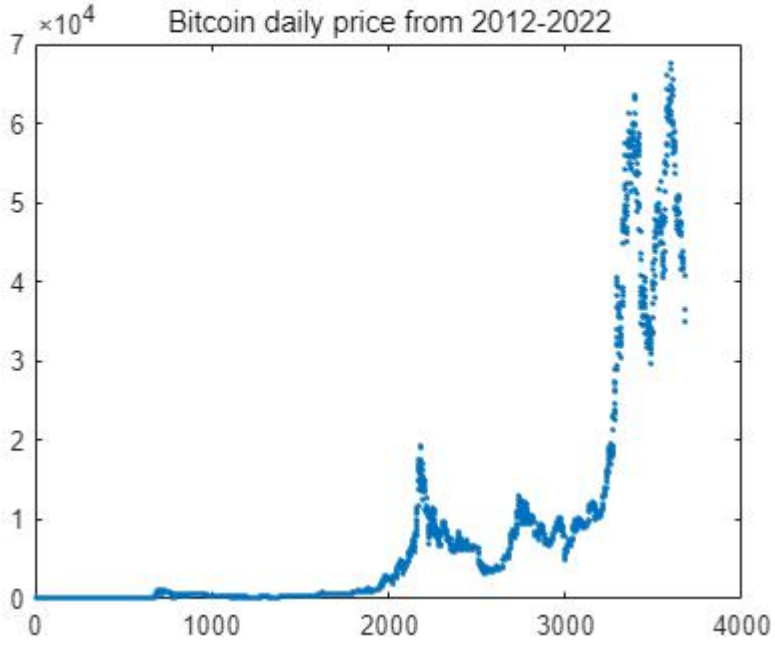
```
n = 4
errL1 = 301.37831
errL2 = 11.59647
errLinf = 0.75030
n = 8
errL1 = 141.28568
errL2 = 5.30837
errLinf = 0.39174
n = 12
errL1 = 64.32769
errL2 = 2.34175
errLinf = 0.18276
n = 16
errL1 = 29.10416
errL2 = 1.04646
errLinf = 0.08311
n = 24
errL1 = 5.94069
errL2 = 0.21260
errLinf = 0.01698
```



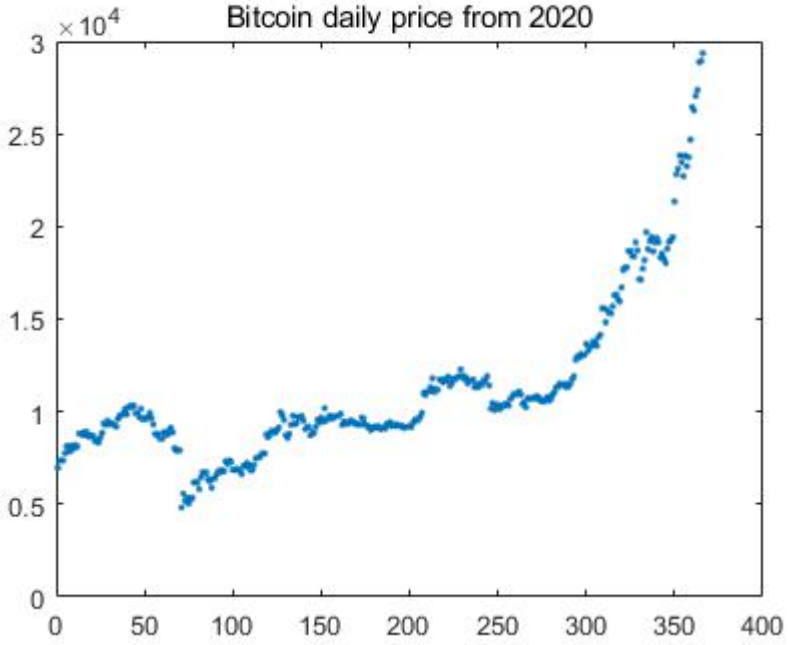
By changing the loop length, we got the errors for L smaller as the n increase, I think it because the loop lengh increase, the model learn to predict it more preciecely.

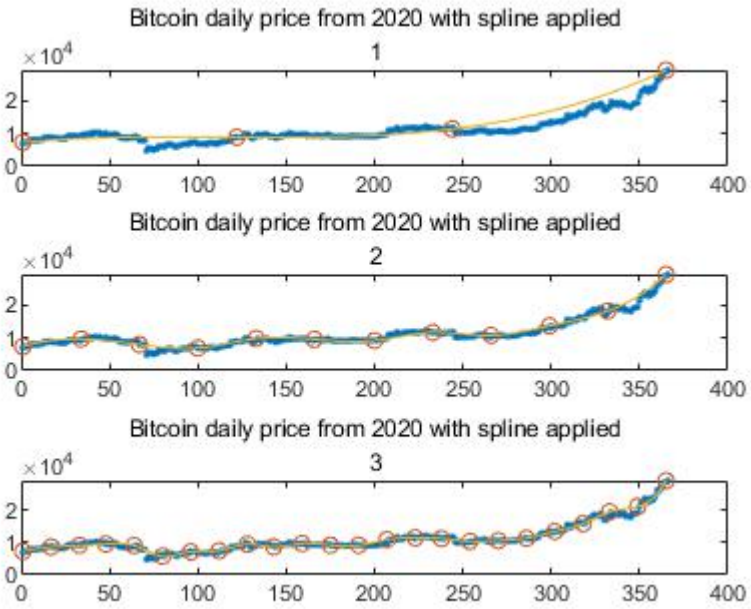
Q4

```
start_date_full = 20120101
end_date_full = 20220122
```




```
start_date_2020 = 20200101
end_date_2020 = 20201231
```





As my observations, as the n increase, the predict is more stablely correct, when it become n = 12, it look like all the points are hitting, when n = 24, the point is hitting all the lane, the n =24 is the best. If we increase the n, the prediction will be more preciece.