Assignment # 3

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Part 1

Sl. No.	σ
1	0.1000
2	0.0562
3	0.0316
4	0.0178
5	0.0100
6	0.0056
7	0.0032
8	0.0018
9	0.0010

Table 1: Values of σ

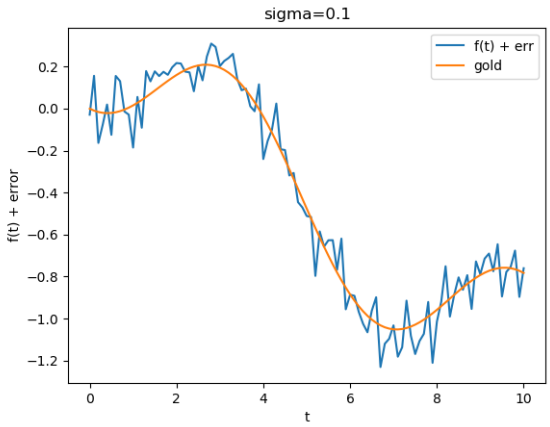

Figure 1: $\sigma = 0.1000$

Part 2

The graphs with error bars is given below.

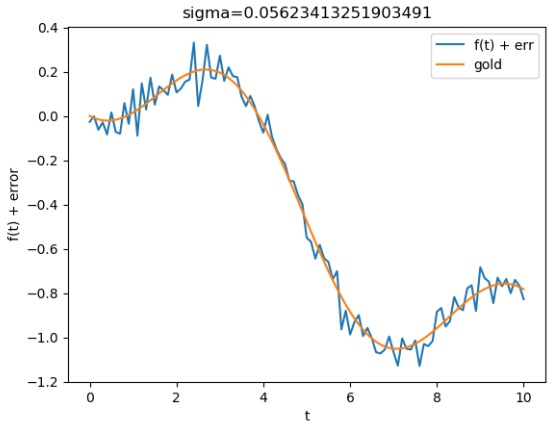

Figure 2: $\sigma = 0.0562$

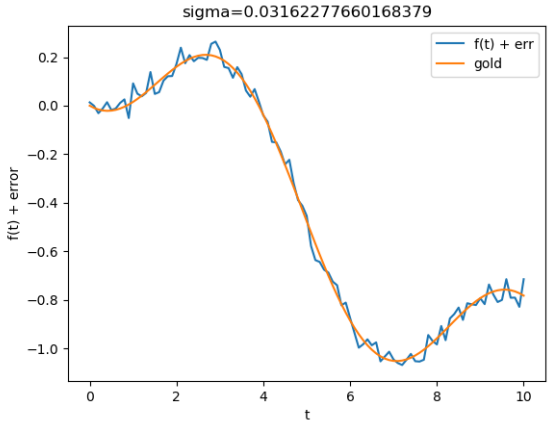

Figure 3: $\sigma = 0.0316$

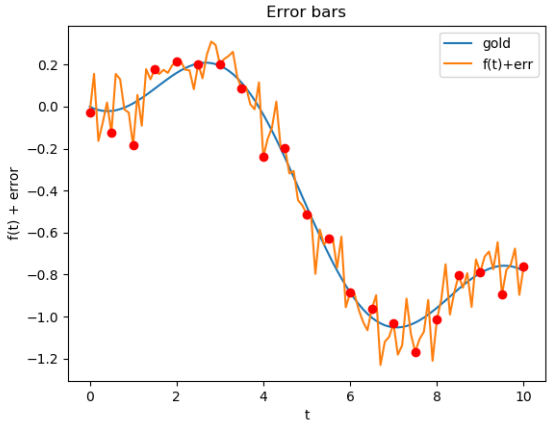

Figure 4: Error bars

Part 3

The contour plot has a single minima. For $\sigma = 0.1000$ the minima occurs at $A = 1.1051$ and $B = -0.1063$. The mean squared error at that particular value of A and B is 0.0082 .

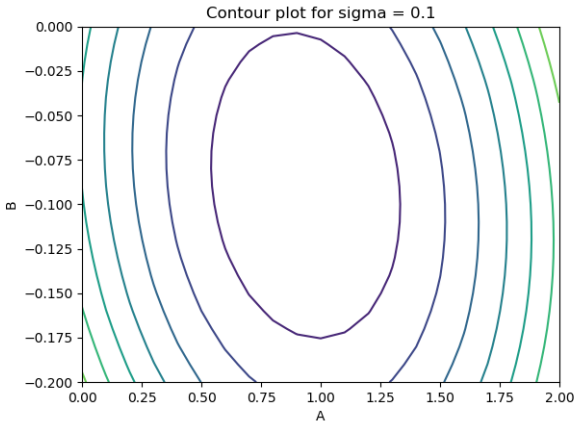

Figure 5: Contour Plot

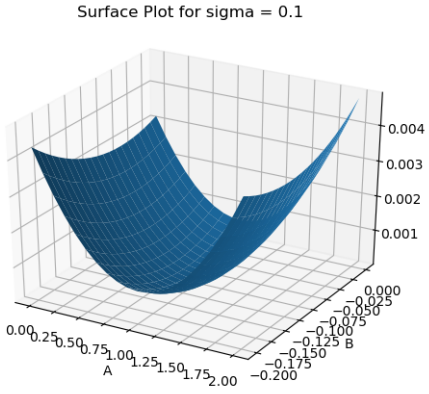

Figure 6: Surface Plot

Part 4

The values of A and B are found out using `scipy.linalg.lstsq` in Python. Then the using the M matrix given in the problem the values of the function are calculated. $f = M \begin{bmatrix} A \\ B \end{bmatrix}$. Then the mean squared error values are calculated using the corresponding column in `fitting.dat` and f.

Part 5

The final plots with error on y-axis and sigma on x-axis is plotted,first in linear scale and then in loglog scale.

Sl. No.	σ	A	B	Mean Error
1	0.1000	1.1050	-0.1063	8.2465e-03
2	0.0562	1.0699	-0.1053	3.1010e-03
3	0.0316	1.0528	-0.1051	1.0081e-03
4	0.0178	1.0555	-0.1055	2.6623e-04
5	0.0100	1.0499	-0.1050	8.3921e-05
6	0.0056	1.0508	-0.1050	3.0413e-05
7	0.0032	1.0508	-0.1049	7.6048e-06
8	0.0018	1.0501	-0.1050	2.6296e-06
9	0.0010	1.0499	-0.1049	9.3969e-07

Table 2: Approximate A and B for different values of σ

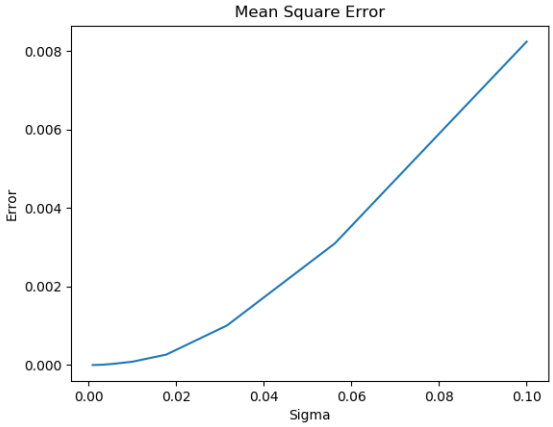

Figure 7: Linear Plot

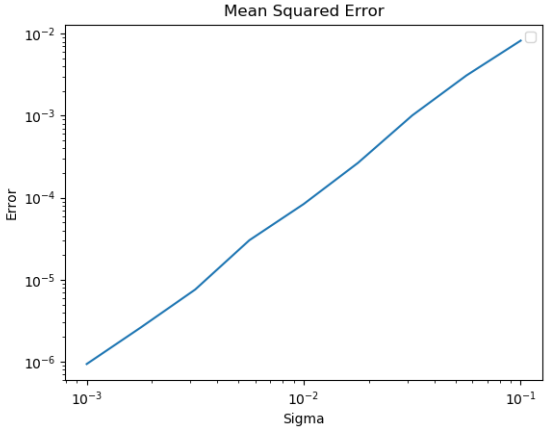

Figure 8: Log-Log Plot