Assignment 3: Fitting Data to Models

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Questions 3 and 4

The plot generated from the data and the exact curve is given in figure 1.
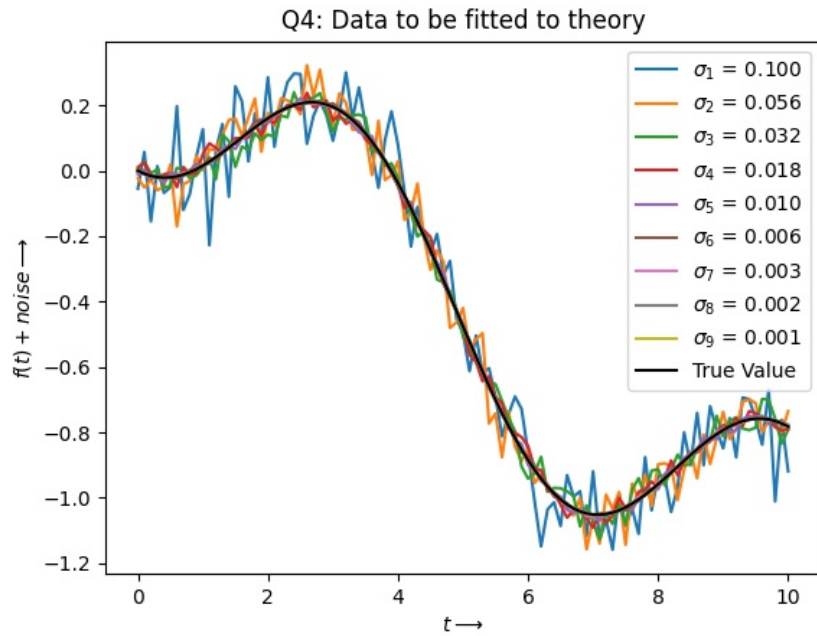

Figure 1: Plot for Q4

Question 5

The plot in figure 2 indicates the difference between the exact curve and the data which contains noise corresponding to $\sigma = 0.10$.
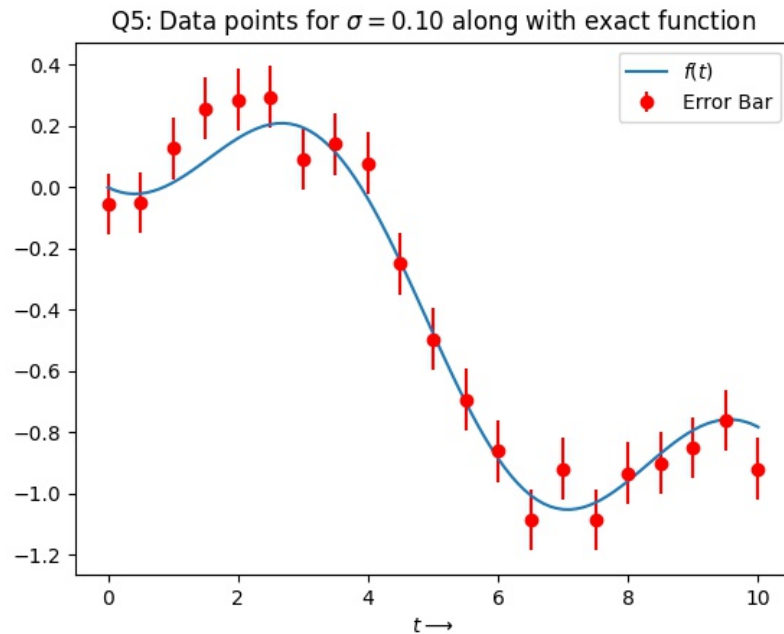
Figure 2: Plot for Q5

Question 6

We can use the function *allclose* in the numpy module to check if two arrays are equal. This function returns true if all corresponding elements in both vectors are within a tolerance level. (Exact equivalence can't be used, since it will fail even if there are very small errors. For example errors of the order 10^{-18} will cause the function to return False).

```
M = np.c_[sp.jv(2, t), t]
print(np.allclose(g(t, 1.05, -0.105), M.dot(np.array([1.05, -0.105]))))
```

Question 8

The contour plot of the mean squared error versus the parameters A and B is given in figure 3. We can see that there is a single minima at the indicated point in the plot.

Question 10

The plot of error in the estimate of A and B with noise is given in figure 4. As we can see, the error in estimate has non linear variation.
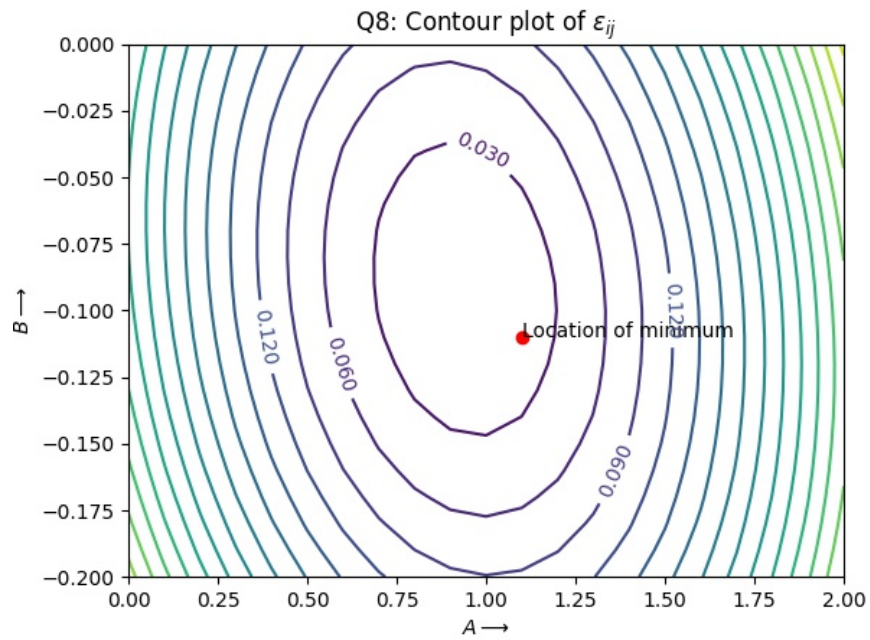
Figure 3: Plot for Q8

Question 11

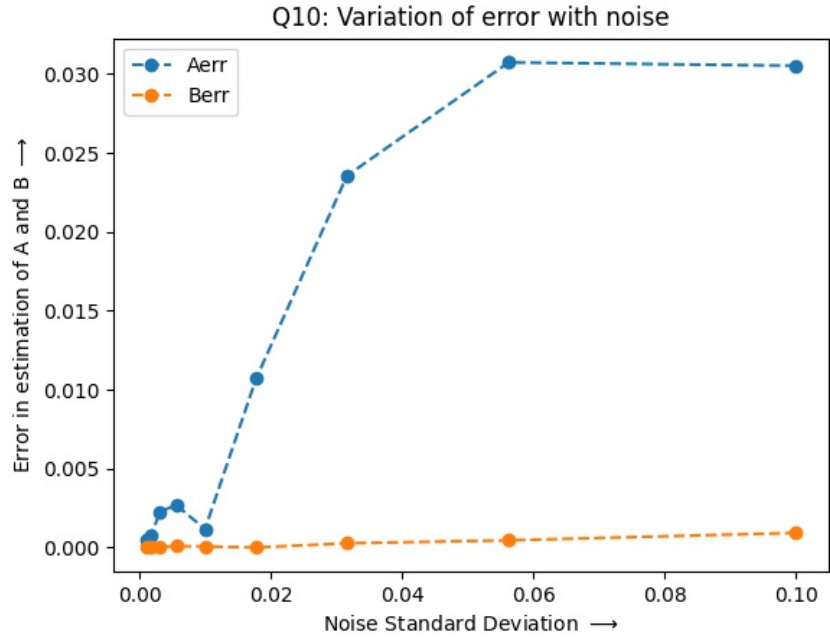The log plot of error in estimate of A and B with noise is given in figure 5. The log-log plot is linear for the most part (barring a few points).
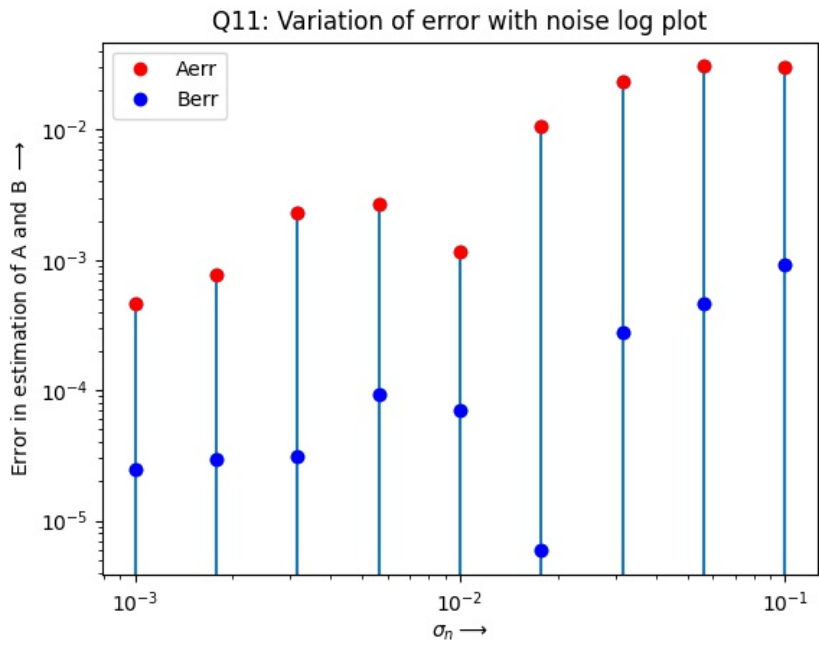
Figure 4: Plot for Q10

Figure 5: Plot for Q11