# EE2703 : Applied Programming Lab
# Assignment 3

Bachotti Sai Krishna Shanmukh
EE19B009

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# Questions 3 and 4

The plot of True values and noisy data is given in Figure 1

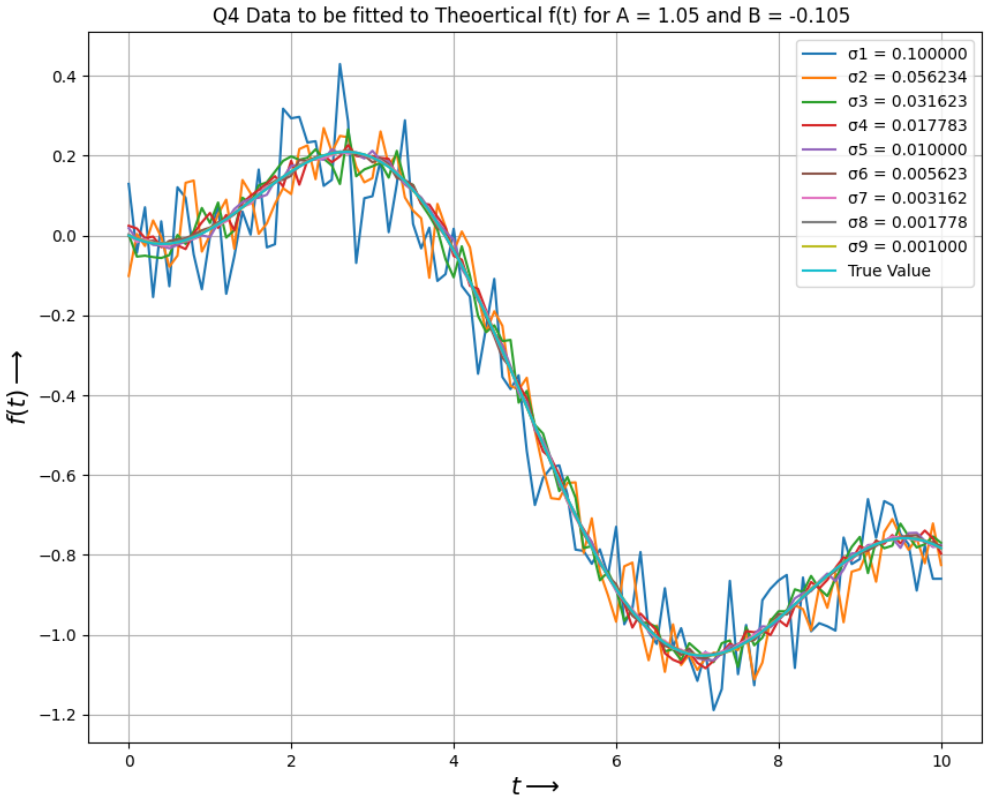


Figure 1: Plot for Q4

# Question 5

The plot in Figure 2 shows the error between True Values and the data corresponding to a noise of standard deviation $\sigma = 0.1$

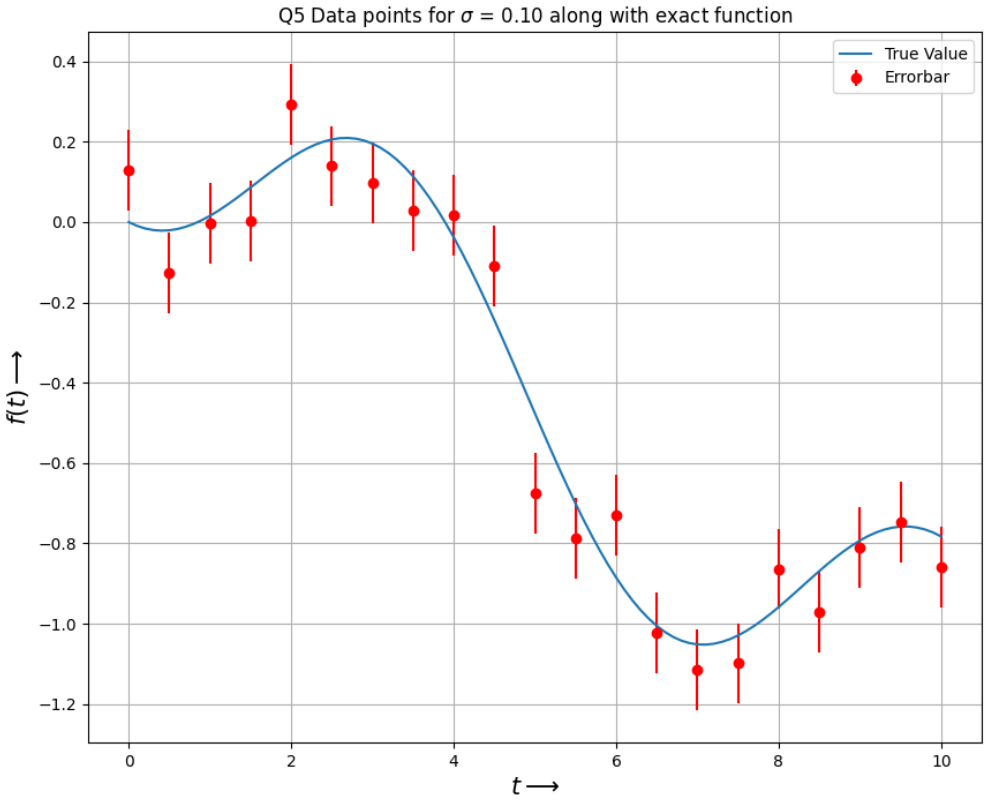


Figure 2: Plot for Q5

# Question 6

Using the function *array_equal* can return False value to arrays which are closely equal, but strictly unequal. This function may not be desirable in this case. We can use the function *allclose* in the NumPy module to check if the two arrays are element-wise equal within a tolerance

```
x = sp.jn(2,t) # Bessel function
M = np.c_[x,t]
v = np.array([
    [A0],
    [B0]
]) # v is a column vector with parameters A0 and B0
res = np.dot(M,v).reshape(-1)
```

```
# Matrix multiplied and Converted to a row vector
np.allclose(y, res)
```

The return value of this function will be True if nearly equal.

# Question 8

The contour plot of the mean squared error versus the parameters A and B is given in Figure 3. We can observe that a single minima is present in the plot

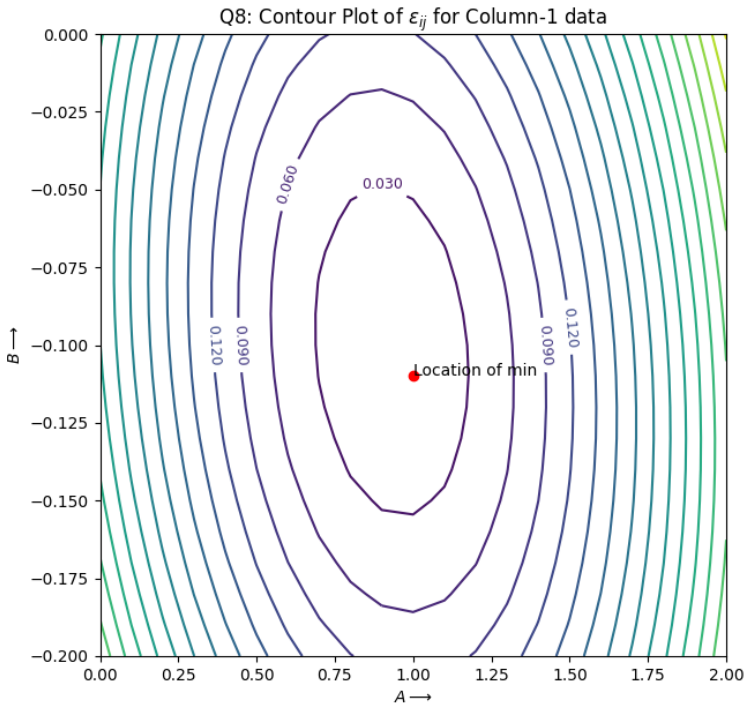


Figure 3: Plot for Q10

# Question 10

The plot of the error in the estimation of A and B parameters with respect to standard deviation ($\sigma$) of the noise is given in Figure 4

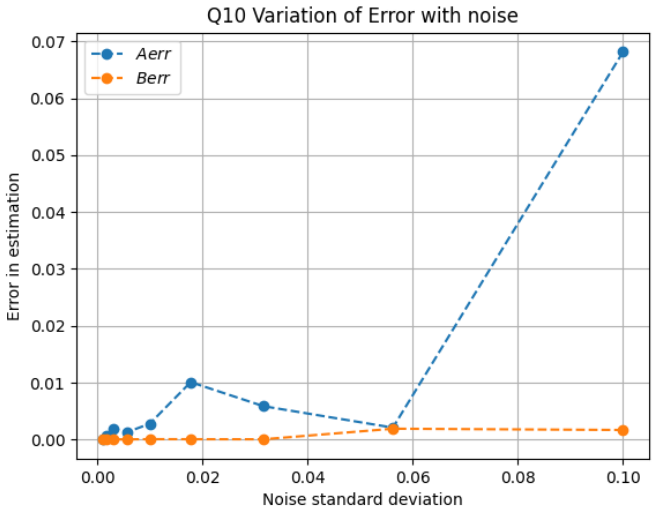


Figure 4: Plot for Q10

The error in estimate of A and B is growing with the noise in a non linear way.

# Question 11

The log-scale plot of error in estimation of A and B parameters with respect to standard deviation ($\sigma$) of the noise is given in Figure 5

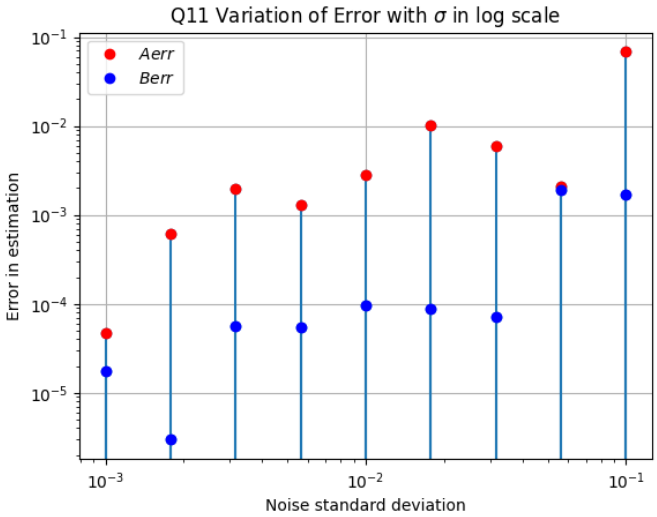


Figure 5: Plot for Q10

The error in estimation of A and B *vs* standard deviation ($\sigma$) of noise has a better linear fit in log scale i.e., Figure 5 compared to the plot in Figure 4