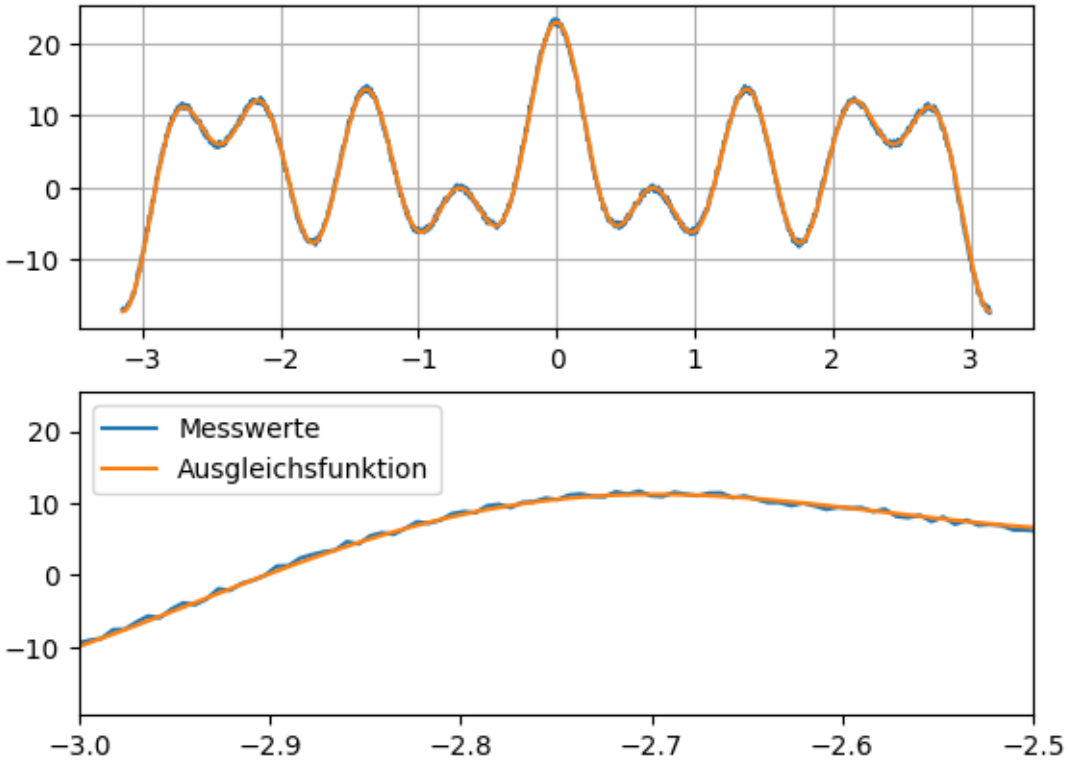
AB6A2

October 13, 2023

[2]:
```
import math
import matplotlib.pyplot as plt
import numpy as np
import scipy as sp
```

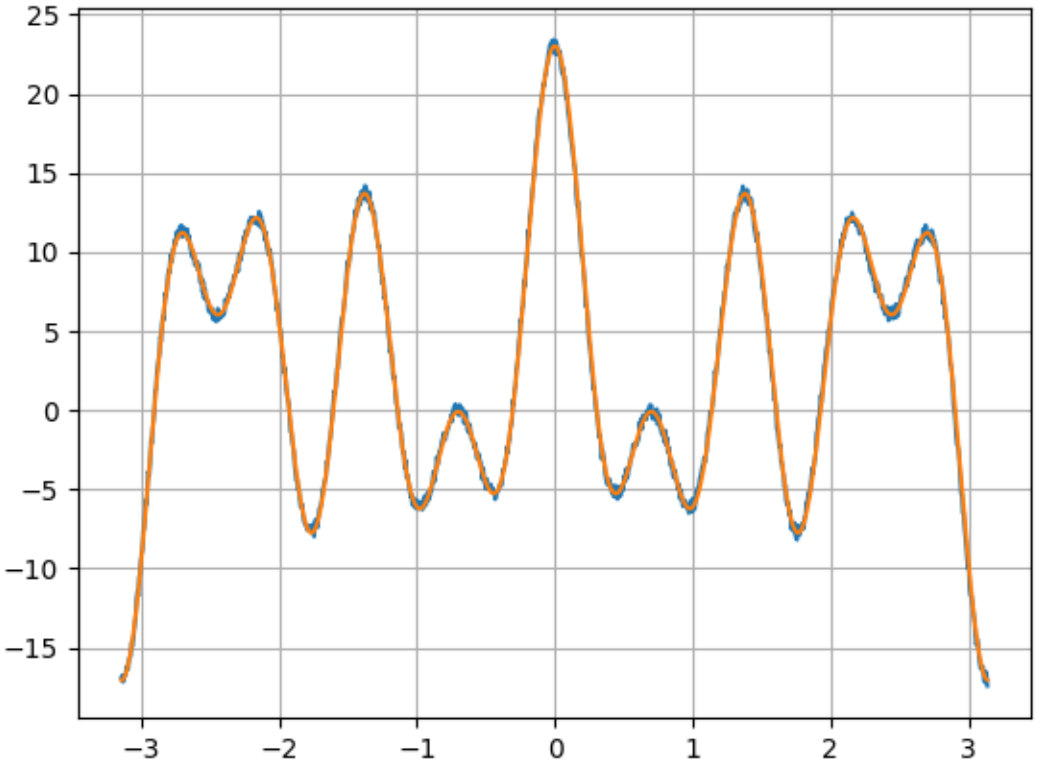
[6]:
```
# 'y_data' data set hidden in exported notebook

data_size = len(y_data)
x_data = [-math.pi + ((2*math.pi*i) / data_size) for i in range(data_size)]


def model_cos (x, l0, l1, l2, l3, l4, l5, l6, l7, l8, l9 ,l10):
    return l0+l1*np.cos(x)+l2*np.cos(x*2)+l3*np.cos(x*3)+l4*np.cos(x*4)+l5*np.
 ↪cos(x*5)\
          +l6*np.cos(x*6)+l7*np.cos(x*7)+l8*np.cos(x*8)+l9*np.cos(x*9)+l10*np.
 ↪cos(x*10)

reg = sp.optimize.curve_fit(model_cos, x_data, y_data)
l_fitted = [reg[0][i] for i in range (11)]
y_fitted = [model_cos(i,␣
 ↪l_fitted[0],l_fitted[1],l_fitted[2],l_fitted[3],l_fitted[4],l_fitted[5],
                      ␣
 ↪l_fitted[6],l_fitted[7],l_fitted[8],l_fitted[9],l_fitted[10]) for i in␣
 ↪x_data]

print("l0,...,l10= ", l_fitted)

fig, (ax1, ax2) = plt.subplots(2)
ax1.plot(x_data, y_data)
ax1.plot(x_data, y_fitted)
ax2.plot(x_data, y_data, label="Messwerte")
ax2.plot(x_data, y_fitted, label="Ausgleichsfunktion")
ax2.set_xlim(-3,-2.5)
ax1.grid()
ax2.grid()
plt.legend()
plt.show()
```

```
l0,…,l10=  [2.9724824145214326, 0.017887956285536855, -0.05152206120341085,
5.038762174399967, -0.039768217332452505, 8.009179069221794,
0.007348135592907479, 0.041965362360981806, -0.05404881946063256,
6.984182645732481, 0.051482634762036406]
```



[7]:
```
def model2_cos(x, l0, l3, l5, l9):
    return l0+l3*np.cos(x*3)+l5*np.cos(x*5)+l9*np.cos(x*9)

reg2 = sp.optimize.curve_fit(model2_cos, x_data, y_data)
l2_fitted = [l_fitted[0], l_fitted[3], l_fitted[5], l_fitted[9]]
y2_fitted = [model2_cos(i, l2_fitted[0],l2_fitted[1],l2_fitted[2],l2_fitted[3])␣
 ↪for i in x_data]

print("Vorhandene Frequenzen: 0HZ:", l2_fitted[0], ", 3HZ:", l2_fitted[1], ",␣
 ↪5HZ:", l2_fitted[2], ", 9HZ:", l2_fitted[3])
plt.plot(x_data, y_data)
plt.plot(x_data, y2_fitted)
plt.grid()
plt.show()
```

```
Vorhandene Frequenzen: 0HZ: 2.9724824145214326 , 3HZ: 5.038762174399967 , 5HZ:
8.009179069221794 , 9HZ: 6.984182645732481
```


25
20
15
10
5
0
−5
−10
−15
−3
−2
−1
0
1
2
3