2. [Multi-dimensioanl Newton Method] In the class, you learned how to find a root of multi-dimensional equations. Let us consider the following equations in 4-dimensional space:

$$\begin{aligned} d(t+0) &= 0.2047 \times 10^{+3} \\ d(t+1) &= 0.1473 \times 10^{+3} \\ d(t+2) &= 0.1059 \times 10^{+3} \\ d(t+3) &= 0.7634 \times 10^{+2} \end{aligned}$$

Here, $t = 10$ and $L = 64$. The theoretical prediction goes that the data should behave as the following function:

$$\begin{aligned} f(t) &= Z_1[\exp(-m_1 t) + \exp(-m_1(L-t))] \\ &+ Z_2(-1)^t[\exp(-m_2 t) + \exp(-m_2(L-t))] \end{aligned}$$

(a) Using the multi-dimensional Newton-Raphson method, solve the above equations and obtain Z_1, m_1, Z_2, and m_2.
HINT: The domain of the parameters is

$$\begin{aligned} 0.5 \times 10^{+4} \leq Z_1 \leq 0.6 \times 10^{+4} \\ 0.1 \leq m_1 \leq 0.5 \\ 0.1 \times 10^{+8} \leq Z_2 \leq 0.5 \times 10^{+8} \\ 0.1 \leq m_2 \leq 5.0 \end{aligned}$$