<u>Homework</u>

→Exercise-1

Closed   3×3 form of $f(x) = Ax^2 + Bx + C$

The parameters over which Least square error should be minimised are A, B, C

$$E_2(f) = \sum_{k=1}^{n} |Ax_k^2 + Bx_k + C - y_k|^2$$

The minimization conditions

$$\frac{dE_2}{dA} = \sum_{k=1}^{n} 2(Ax_k^2 + Bx_k + C - y_k)\, x_k^2 = 0 \longrightarrow ①$$

$$\frac{dE_2}{dB} = \sum_{k=1}^{n} 2(Ax_k^2 + Bx_k + C - y_k)\, x_k = 0 \longrightarrow ②$$

$$\frac{dE_2}{dC} = \sum_{k=1}^{n} 2(Ax_k^2 + Bx_k + C - y_k) = 0 \longrightarrow ③$$

Upon rearranging into 3×3 matrix,

$$\begin{bmatrix} \sum_{k=1}^{n} x_k^4 & \sum_{k=1}^{n} x_k^3 & \sum_{k=1}^{n} x_k^2 \\ \sum_{k=1}^{n} x_k^3 & \sum_{k=1}^{n} x_k^2 & \sum_{k=1}^{n} x_k \\ \sum_{k=1}^{n} x_k^2 & \sum_{k=1}^{n} x_k & n \end{bmatrix} \begin{bmatrix} A \\ B \\ C \end{bmatrix} = \begin{bmatrix} \sum_{k=1}^{n} y_k x_k^2 \\ \sum_{k=1}^{n} y_k x_k \\ \sum_{k=1}^{n} y_k \end{bmatrix}$$

is in the form of $Ax = b$

→ $y = A\cos(Bx) + C$

$$E_2(f) = \sum_{k=1}^{n} |A\cos(Bx_k) + C - y_k|^2$$