$$y = mx + b$$
$$m = \text{slope}$$
$$b = \text{intercept}$$

Given matrices:

$$x = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} \text{ and y } = \begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix}$$

The equation in matrix form:

$$y = mx + b$$
$$y = \begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} = \begin{bmatrix} 1 & x_1 \\ 1 & x_2 \\ 1 & x_3 \end{bmatrix} \cdot \begin{bmatrix} b \\ m \end{bmatrix} = \begin{bmatrix} b + mx_1 \\ b + mx_2 \\ b + mx_3 \end{bmatrix}$$

$$XB = Y$$
$$\left(X^T X\right)^{-1} X^T XB = \left(X^T X\right)^{-1} X^T Y$$
$$B = \left(X^T X\right)^{-1} X^T Y$$

Where:

X^T represents the transpose of matrix X.

X^{-1} represents the inverse of matrix X.

$$BIC_k = n\ ln(SSE) + k\ ln(x)$$

Where,

$$k = degree$$
$$SSE = \text{sum of squared errors}$$
$$n = \text{number of data points}$$

$$MSE = \frac{1}{n} \sum_{i=1}^{n} (Y_i - \hat{Y}_i)^2$$

Where,

$$n = \text{number of data points}$$
$$Y_i = \text{real values}$$
$$\hat{Y}_i = \text{predicted values}$$

You can rewrite MSE as

$$
\begin{aligned}
MSE &= \frac{1}{n}\sum_{i=1}^{n}(y_i - (m\,x_i + b))^2 \\
\text{let, } f(m,b) &= (y_i - (m\,x_i + b))^2 \\
\text{Partial derivatives,} & \\
\text{let, } g(m,b) &= y_i - (mx_i + b) \\
\text{so, } f(m,b) &= g(m,b)^2 \\
\frac{\partial f}{\partial m} &= 2\,g(m,b)\,g' \\
\text{now, } g' &= \frac{\partial g}{\partial m} = 0 - (1\,x_i + 0) \\
&= -\,x_i \\
\text{expanding,} & \\
\frac{\partial f}{\partial m} &= 2\,(y_i - (m\,x_i + b))^2 \ \cdot (-x_i) \\
&= -2\,x_i \cdot (y_i - (m\,x_i + b)) \\
\text{now,} & \\
\frac{\partial f}{\partial b} &= 2\,g(m,b)\,g' \\
\text{now, } g' &= \frac{\partial f}{\partial b} = 0 - (0 \cdot 0 + 1) = -1 \\
\text{expanding,} & \\
\frac{\partial f}{\partial b} &= 2 \cdot (y_i - (m\,x_i + b))^2 \cdot -1 \\
&= -2\,(y_i - (m\,x_i + b))
\end{aligned}
$$

Final answer,

$$
\begin{aligned}
\frac{\partial}{\partial m} &= \frac{2}{n}\sum_{i=1}^{n} -x_i(y_i - (m\,x_i + b)) \\
\frac{\partial}{\partial b} &= \frac{2}{n}\sum_{i=1}^{n} -(y_i - (m\,x_i + b))
\end{aligned}
$$