$$
\begin{aligned}
y &= mx + b \\
m &= \text{slope} \\
b &= \text{intercept}
\end{aligned}
$$

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:

$$y = mx + b$$

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

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

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,

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

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

Where,

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

You can rewrite MSE as

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

Partial derivative w.r.t m,

$$
\begin{aligned}
\frac{\partial f}{\partial m} &= 2\,g(m,b)\cdot\frac{\partial g}{\partial m} \\
\text{now, } \frac{\partial g}{\partial m} &= 0 - (1\,x_i + 0) \\
&= -\,x_i \\
\text{expanding,} & \\
\frac{\partial f}{\partial m} &= 2\,(y_i - (m\,x_i + b))\ \cdot(-x_i) \\
&= -2\,x_i\cdot(y_i - (m\,x_i + b))
\end{aligned}
$$

Partial derivative w.r.t b,

$$
\begin{aligned}
\frac{\partial f}{\partial b} &= 2\,g(m,b)\cdot\frac{\partial g}{\partial b} \\
\text{now, } \frac{\partial g}{\partial b} &= 0 - (0\cdot 0 + 1) \\
&= -1 \\
\text{expanding,} & \\
\frac{\partial f}{\partial b} &= 2\cdot(y_i - (m\,x_i + b))^2\cdot -1 \\
&= -2\,(y_i - (m\,x_i + b))
\end{aligned}
$$

Final answer,

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