Formulário - INTERPOLAÇÃO - MINIMOS QUADRADOS

$$\begin{aligned} l_k(x) &= \frac{(x-x_0)(x-x_1)\cdots(x-x_{k-1})(x-x_{k+1})\cdots(x-x_n)}{(x_k-x_0)(x_k-x_1)\cdots(x_k-x_{k-1})(x_k-x_{k+1})\cdots(x_k-x_n)} \\ &= \prod_{j=0, j\neq k}^{n} \frac{(x-x_j)}{(x_k-x_j)} \end{aligned}$$

$$P_n(x) = \sum_{k=0}^{n} l_k(x) f(x_k) = l_0(x)f(x_0) + l_1(x)f(x_1) + \cdots + l_n(x)f(x_n)$$

$$P_n(x) = f(x_0) + \sum_{k=1}^{n} f[x_0, x_1, \cdots, x_k](x-x_0)(x-x_1)\cdots(x-x_{k-1})$$

$$f[x_0, x_1, \cdots, x_n] = \frac{f[x_1, x_2, \cdots, x_n] - f[x_0, x_1, \cdots, x_{n-1}]}{x_n - x_0}$$

$$\begin{aligned} f[x_i, x_j] &= f[x_j, x_i] = \frac{f(x_j) - f(x_i)}{x_j - x_i} && \text{Dif. divididas 1a. ordem} \\ f[x_i, x_{i+1}, x_{i+2}] &= \frac{f[x_{i+1}, x_{i+2}] - f[x_i, x_{i+1}]}{x_{i+2} - x_i} && \text{Dif. divididas 2a. ordem} \\ f[x_i, x_{i+1}, x_{i+2}, x_{i+3}] &= \frac{f[x_{i+1}, x_{i+2}, x_{i+3}] - f[x_i, x_{i+1}, x_{i+2}]}{x_{i+3} - x_i} && \text{Dif. divididas 3a. ordem} \end{aligned}$$

$$E_n(x) = f(x) - P_n(x) = (x-x_0)(x-x_1)\cdots(x-x_n)\frac{f^{(n+1)}(\xi_x)}{(n+1)!} \text{ onde } \xi_x \in [x_0,\ x_n]$$

$$g(x) = \alpha_0 g_0(x) + \alpha_1 g_1(x) + \cdots + \alpha_m g_m(x)$$

$$\begin{bmatrix} (\mathbf{g}_0, \mathbf{g}_0) & (\mathbf{g}_0, \mathbf{g}_1) & \cdots & \cdots & (\mathbf{g}_0, \mathbf{g}_m) \\ (\mathbf{g}_1, \mathbf{g}_0) & (\mathbf{g}_1, \mathbf{g}_1) & \cdots & \cdots & (\mathbf{g}_1, \mathbf{g}_m) \\ \vdots & \vdots & \cdots & \cdots & \vdots \\ \vdots & \vdots & \cdots & \cdots & \vdots \\ (\mathbf{g}_m, \mathbf{g}_0) & (\mathbf{g}_m, \mathbf{g}_1) & \cdots & \cdots & (\mathbf{g}_m, \mathbf{g}_m) \end{bmatrix} \begin{bmatrix} \alpha_0 \\ \alpha_1 \\ \vdots \\ \vdots \\ \alpha_m \end{bmatrix} = \begin{bmatrix} (\mathbf{f}, \mathbf{g}_0) \\ (\mathbf{f}, \mathbf{g}_1) \\ \vdots \\ \vdots \\ (\mathbf{f}, \mathbf{g}_m) \end{bmatrix}$$