FORMULÁRIO

Número de condição de $f(x)$

$$\left|\frac{xf'(x)}{f(x)}\right|$$

Métodos de resolução de equações não lineares

$$x_{n+1} = x_n - \frac{x_n - x_{n-1}}{f(x_n) - f(x_{n-1})} f(x_n), \qquad x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)},$$

$$x_{n+1} = g(x_n), \qquad \text{e} \qquad \mid \bar{x} - \eta \mid \leq \frac{\mid f(\bar{x}) \mid}{K}$$

Equações polinomiais

Para $P(x) = a_n x^n + a_{n-1}x^{n-1} + \cdots + a_0$, $\quad \mid x_i \mid < 1 + \frac{A}{|a_n|} \quad$ e $\quad R = 1 + \sqrt[i]{\frac{\beta}{a_n}}$, com $A = \max\{\mid a_{n-1} \mid, \mid a_{n-2} \mid, \ldots, \mid a_0 \mid\}$ ou, β o maior dos valores absolutos dos coeficientes negativos de $P(x)$.

Fórmulas de Newton

$$P_n(x) = y_0 + s\Delta y_0 + \frac{s(s-1)}{2!}\Delta^2 y_0 + \cdots + \frac{s(s-1)\cdots(s-n+1)}{n!}\Delta^n y_0$$

$$P_n(x) = y_n + s\nabla y_n + \frac{s(s+1)}{2!}\nabla^2 y_n + \cdots + \frac{s(s+1)\cdots(s+n-1)}{n!}\nabla^n y_n$$

com $s = \frac{x - x_0}{h}$ e $s = \frac{x - x_n}{h}$ respectivamente.

$$P_n(x) = y_0 + [x_0, x_1](x - x_0) + \cdots + [x_0, x_1, \ldots, x_n](x - x_0)(x - x_1)\cdots(x - x_{n-1})$$

Fórmula de Lagrange

$$P_n(x) = \sum_{i=0}^{n} f_i . l_i \qquad \text{onde} \qquad l_i = \prod_{k=0, k\neq i}^{n} \frac{x - x_k}{x_i - x_k}$$

Métodos iterativos

$$\parallel \mathbf{x} - \mathbf{x}^{(\mathrm{k})} \parallel \leq \frac{\parallel \mathrm{G} \parallel^{\mathrm{k}+1}}{1 - \parallel \mathrm{G} \parallel} \parallel \mathbf{d} \parallel$$

Factorizações

$$u_{ij} = a_{ij} - \sum_{k=1}^{i-1} l_{ik} u_{kj} \qquad j \geq i \qquad\qquad l_{ij} = \frac{\left(a_{ij} - \sum_{k=1}^{j-1} l_{ik} u_{kj}\right)}{u_{jj}} \qquad j < i$$

$$l_{ij} = a_{ij} - \sum_{k=1}^{j-1} l_{ik} u_{kj} \qquad j \leq i \qquad\qquad u_{ij} = \frac{\left(a_{ij} - \sum_{k=1}^{i-1} l_{ik} u_{kj}\right)}{l_{ii}} \qquad j > i$$

Método de Newton: $\qquad \mathbf{x}^{(\mathrm{n+1})} = \mathbf{x}^{(\mathrm{n})} - \mathrm{W}^{-1}(\mathbf{x}^{(\mathrm{n})}) \ \ \mathrm{f}(\mathbf{x}^{(\mathrm{n})})$

Regra dos trapézios e regra de Simpson

$$\int_a^b f(x)dx \approx \frac{h}{2}\left[f(a) + f(b)\right] + h\sum_{i=1}^{n-1} f(x_i) \quad \text{com} \quad h = \frac{b-a}{n}$$

$$\int_a^b f(x)dx \approx \frac{h}{3}\left(f(a) + f(b) + 4\sum_{i=1}^{n/2} f(x_{2i-1}) + 2\sum_{i=1}^{(n/2)-1} f(x_{2i})\right) \quad \text{com} \quad h = \frac{b-a}{n}$$

$E_n(f) = -\frac{n.h^3}{12} f''(\eta)$ e $E_n(f) = -\frac{n.h^5}{180} f^{(4)}(\eta)$ com $\eta \in [a, b]$.

Aproximação

$$a = \frac{n(\sum x_i y_i) - (\sum x_i)(\sum y_i)}{n(\sum x_i^2) - (\sum x_i)^2} \qquad\qquad a\sum x_i + nb = \sum y_i$$

Integração por série de Taylor

$$y_{n+1} = y_n + hT_k(x_n, y(x_n))$$

$$T_k(x, y) = f(x, y) + \frac{h}{2!} f'(x, y) + \cdots + \frac{h^{k-1}}{k!} f^{(k-1)}(x, y)$$

Método de Runge-Kutta de ordem 2

$y_{n+1} = y_n + \frac{1}{2}(K_1 + K_2)$ com $K_1 = hf(x_n, y_n)$, $K_2 = hf(x_n + h, y_n + K_1)$

Métodos de Adams-Bashfort

$$y_{n+1} = y_n + \frac{h}{2}\left[3f(x_n, y_n) - f(x_{n-1}, y_{n-1})\right]$$

$$y_{n+1} = y_n + \frac{h}{12}\left[23f(x_n, y_n) - 16f(x_{n-1}, y_{n-1}) + 5f(x_{n-2}, y_{n-2})\right]$$

Métodos de Adams-Moulton

$$y_{n+1} = y_n + \frac{h}{12}\left[5f(x_{n+1}, y_{n+1}) + 8f(x_n, y_n) - f(x_{n-1}, y_{n-1})\right]$$

$$y_{n+1} = y_n + \frac{h}{24}\left[9f(x_{n+1}, y_{n+1}) + 19f(x_n, y_n) - 5f(x_{n-1}, y_{n-1}) + f(x_{n-2}, y_{n-2})\right]$$