Formulario

Trigonometría esférica

- Área: $S = r^2\epsilon$ (exceso esférico en radianes)
- $\frac{\operatorname{sen} a}{\operatorname{sen} A} = \frac{\operatorname{sen} b}{\operatorname{sen} B}$, $\quad \cos a = \cos b \cos c + \sin b \sin c \cos A$.
- $\cot a \operatorname{sen} b = \cos b \cos C + \sin C \cot A$, $\quad \cos A = -\cos B \cos C + \sin B \sin C \cos a$.
- $\frac{\operatorname{sen}\frac{A+B}{2}}{\cos\frac{C}{2}} = \frac{\cos\frac{a-b}{2}}{\cos\frac{c}{2}}$, $\quad \frac{\operatorname{sen}\frac{A-B}{2}}{\cos\frac{C}{2}} = \frac{\operatorname{sen}\frac{a-b}{2}}{\operatorname{sen}\frac{c}{2}}$, $\quad \frac{\cos\frac{A+B}{2}}{\operatorname{sen}\frac{C}{2}} = \frac{\cos\frac{a+b}{2}}{\cos\frac{c}{2}}$, $\quad \frac{\cos\frac{A-B}{2}}{\operatorname{sen}\frac{C}{2}} = \frac{\operatorname{sen}\frac{a+b}{2}}{\operatorname{sen}\frac{c}{2}}$.
- $\frac{\tan\frac{A+B}{2}}{\cot\frac{C}{2}} = \frac{\cos\frac{a-b}{2}}{\cos\frac{a+b}{2}}$, $\quad \frac{\tan\frac{A-B}{2}}{\cot\frac{C}{2}} = \frac{\operatorname{sen}\frac{a-b}{2}}{\operatorname{sen}\frac{a+b}{2}}$, $\quad \frac{\tan\frac{a+b}{2}}{\tan\frac{c}{2}} = \frac{\cos\frac{A-B}{2}}{\cos\frac{A+B}{2}}$, $\quad \frac{\tan\frac{a-b}{2}}{\tan\frac{c}{2}} = \frac{\operatorname{sen}\frac{A-B}{2}}{\operatorname{sen}\frac{A+B}{2}}$.

Resolución de ecuaciones

- Bisección: $c = (b+a)/2$, $E_n = \frac{b-a}{2^n}$.
- Newton-Raphson: $x_{n+1} = x_n - f(x_n)/f'(x_n)$, $E_{n+1} = \frac{f''(\xi)}{2f'(x_n)}E_n^2$. Secante: $x_{n+2} = \frac{f(x_{n+1})x_n - f(x_n)x_{n+1}}{f(x_{n+1})-f(x_n)}$
- Punto fijo: $x_n = F(x_{n-1})$, $E_{n+1} \leq K^n \frac{|x_1-x_0|}{1-K}$
- Jacobi: $Dx_{k+1} = -(L+U)x_k + b$. Gauss-Seidel: $(D+L)x_{k+1} = -Ux_k + b$
- Sistemas no lineales (Newton): $\mathbf{J}(\mathbf{x_n})(\mathbf{x}_{n+1} - \mathbf{x}_n) = -F(\mathbf{x}_n)$

Interpolación e integración

- Error de interpolación: $f(x) - P_n(x) = \frac{f^{(n+1)}}{(n+1)!}(x-x_0)(x-x_1)\ldots(x-x_n)$
- Lagrange: $L_i(x) = \frac{\prod_{j\neq i}(x-x_j)}{\prod_{j\neq i}(x_i-x_j)}$
- Diferencias divididas: $f[x_k] = f(x_k)$, $f[x_i, x_{i+1}, \ldots, x_j] = \frac{f[x_{i+1},x_{i+2},\ldots,x_j] - f[x_i,x_{i+1},\ldots,x_{j-1}]}{x_j - x_i}$

  $p(x) = f[x_0] + f[x_0,x_1](x-x_0) + f[x_0,x_1,x_2](x-x_0)(x-x_1) + \ldots + f[x_0,x_1,...,x_n](x-x_0)(x-x_1)\ldots(x-x_{n-1})$.
- Trapecio: $\int_a^b f(x)\,dx \approx \frac{h}{2}(f(a)+f(b))$. Error $-\frac{(b-a)^3}{12}f''(\xi)$.
- Simpson: $\int_a^b f(x)\,dx \approx \frac{h}{3}(f(a)+4f(x_1)+f(b))$. Error $-\frac{(b-a)^5}{720}f^{(4)}(\xi)$.
- Trapecio compuesto: $\int_a^b f(x)\,dx \approx \frac{h}{2}(f(x_0)+2f(x_1)+\ldots+2f(x_{n-1})+f(x_n))$

Ecuaciones diferenciales

- Ecuación lineal: $x(t) = x(t_0)exp(A(t)) + exp(A(t))\int_{t_0}^t b(s)exp(-A(s))\,ds$
- Método de Euler: $x_{k+1} = x_k + hf(t_k, x_k)$
- Método de Euler modificado: $x_{k+1} = x_k + \frac{h}{2}\Big(f(t_k,x_k) + f(t_k+h, x_k + hf(t_k,x_k)\Big)$