

SOME FORMULAS

- $\int_a^b f(x)dx \approx (b-a)f(a)$
- $\int_a^b f(x)dx \approx (b-a)f\left(\frac{a+b}{2}\right)$
- $\int_a^b f(x)dx \approx \frac{1}{2}(b-a)[f(a)+f(b)]$
- $\int_a^b f(x)dx \approx \frac{h}{2}[f(a)+f(b)]+h\sum_{i=1}^{M-1}f(x_i)$, where $x_0 = a$, $x_M = b$, $h = \frac{b-a}{M}$
- $\int_a^b f(x)dx \approx \frac{1}{6}(b-a)\left[f(a)+4f\left(\frac{a+b}{2}\right)+f(b)\right]$
- $\int_a^b f(x)dx \approx \frac{h}{3}\sum_{k=1}^M[f(x_{2k-2})+4f(x_{2k-1})+f(x_{2k})]$ where $x_0 = a$, $x_{2M} = b$, $h = \frac{b-a}{2M}$
- $f'(x) \approx \frac{f(x+h)-f(x-h)}{2h}$, $f'(x) \approx \frac{-f(x+2h)+8f(x+h)-8f(x-h)+f(x-2h)}{12h}$
- $f'(x) \approx \frac{f(x\pm h)-f(x)}{\pm h}$, $f'(x) \approx \frac{-f(x\pm 2h)+4f(x\pm h)-3f(x)}{\pm 2h}$
- $f''(x) \approx \frac{f(x\pm 2h)-2f(x\pm h)+f(x)}{h^2}$
- $f''(x) \approx \frac{f(x+h)-2f(x)+f(x-h)}{h^2}$
- $y_{n+1} = y_n + hf(y_n, t_n) + \frac{1}{2!}h^2f'(y_n, t_n) + \dots + \frac{1}{p!}h^p f^{(p-1)}(y_n, t_n)$
- $y_{n+1} = y_n + \frac{1}{2}(k_1 + k_2)$ where $k_1 = hf(y_n, t_n)$, $k_2 = hf(y_n + k_1, t_n + h)$
- $y_{n+1} = y_n + \frac{1}{6}(k_1 + 2k_2 + 2k_3 + k_4)$
where $k_1 = hf(y_n, t_n)$, $k_2 = hf(y_n + \frac{1}{2}k_1, t_n + \frac{1}{2}h)$, $k_3 = hf(y_n + \frac{1}{2}k_2, t_n + \frac{1}{2}h)$, $k_4 = hf(y_n + k_3, t_n + h)$
- $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$, $X^{(n+1)} = X^{(n)} - [J(X^{(n)})]^{-1}F(X^{(n)})$ where $[J_{ij}] = \partial F_i / \partial x_j$
- $x_{n+1} = x_n - \left(\frac{x_n - x_{n-1}}{f(x_n) - f(x_{n-1})} \right) f(x_n)$
- $(D+L)X^{(k)} = -UX^{(k-1)} + B$, $DX^{(k)} = -(L+U)X^{(k-1)} + B$ where $AX = (D+L+U)X = B$
- $f(x) \approx p_n(x) = f[x_0] + f[x_1, x_0](x-x_0) + f[x_2, x_1, x_0](x-x_0)(x-x_1) + \dots + f[x_n, x_{n-1}, \dots, x_1, x_0] \prod_{i=0}^{n-1} (x-x_i)$
- $f[x_n, x_{n-1}, \dots, x_1, x_0] = \frac{f[x_n, x_{n-1}, \dots, x_1] - f[x_{n-1}, \dots, x_0]}{x_n - x_0}$
- $f(x) \approx p_n(x) = \sum_{i=0}^n L_i(x)f(x_i)$ where $L_i(x) = \prod_{k=0, k \neq i}^n \frac{x-x_k}{x_i-x_k}$
- $S(x) = \bigcup_j S_j(x)$ where $S_j(x) = a_j + b_j(x-x_j) + c_j(x-x_j)^2 + d_j(x-x_j)^3$