SOLUCIÓN NUMÉRICA DE ECUACIONES DIFERENCIALES

Método de Euler

$$\boxed{\begin{array}{l} y_{n+1} = y_i + h\, f(x_i, y_i) \\ n = 0,1,\ 2,\ldots \end{array}}$$

Método de Euler Gauss (Euler mejorado)

$$\boxed{\begin{array}{l} y_{n+1_P} = y_n + hf(x_n, y_n) \\ y_{n+1_C} = y_n + \dfrac{h}{2}\left[f(x_n, y_n) + f(x_{n+1}, y_{n+1_P}) \right] \\ n = 0,1,2,\ldots \end{array}}$$

Método de la serie de Taylor

$$y' = f(x, y)$$

$$y(x) = y(x_0) + y'(x_0)(x - x_0) + \frac{y''(x_0)}{2!}(x - x_0)^2 + \frac{y'''(x_0)}{3!}(x - x_0)^3 + \ \ldots + + \frac{y^n(x_0)}{n!}(x - x_0)^n$$

Método de Runge-Kutta de 2º orden

$$\boxed{\begin{array}{l} y_{n+1} = y_n + \dfrac{h}{2}\ k_1 + k_2 \\ n = 0,\ 1,\ 2,\ldots \\ \text{donde} \\ k_1 = f(x_{n,}, y_n) \\ k_2 = f(x_n + h, y_n + k_1) \end{array}}$$

Método de Runge-Kutta de 4º orden

$$y_{n+1} = y_n + \frac{h}{6}(k_1 + 2k_2 + 2k_3 + k_4) \qquad n = 0,1,2,\ldots$$
$$k_1 = f(x_n, y_n)$$
$$k_2 = f(x_n + \frac{h}{2}, y_n + \frac{h}{2}k_1)$$
$$k_3 = f(x_n + \frac{h}{2}, y_n + \frac{h}{2}k_2)$$
$$k_4 = f(x_n + h, y_n + hk_3)$$

Método de Milne

MÉTODO DE TAYLOR

$$y' = f(x, y)$$

$$y(x) = y(x_0) + y'(x_0)(x - x_0) + \frac{y''(x_0)}{2!}(x - x_0)^2 + \frac{y'''(x_0)}{3!}(x - x_0)^3 + \ldots + + \frac{y^n(x_0)}{n!}(x - x_0)^n$$

MÉTODO DE MILNE

Ecuación predictora

$$y_{i+1p} = y_{i-3} + \frac{4}{3}h[2f(x_{i-2}, y_{i-2}) - f(x_{i-1}, y_{i-1}) + 2f(x_i, y_i)]$$

$i = 3, 4, 5, \ldots$

Ecuación correctora

$$y_{i+1C} = y_{i-1} + \frac{h}{3}[f(x_{i-1}, y_{i-1}) + 4f(x_i, y_i) + f(x_{i+1}, y_{i+1p})]$$

$i = 3, 4, 5, \ldots$

Método de diferencias finitas

$$\Delta x = h = \frac{x_F - x_I}{n - 1}$$

$$\left.\frac{d^2 y}{dx^2}\right|_i \approx \frac{y_{i+1} - 2y_i + y_{i-1}}{(\Delta x)^2}$$

$$\left.\frac{dy}{dx}\right|_i \approx \frac{y_{i+1} - y_i}{\Delta x}$$