

Regra do Ponto Médio

$$\begin{cases} y' = -y + x + 2 \\ y(0) = 2 \Rightarrow y_0 = 2 \\ 0 \leq x \leq 0,3 \Rightarrow h = 0,1 \end{cases} \quad \begin{aligned} y' = f &= -y + x + 2 \\ f' &= -1y' + 1 = -1(-y + x + 2) + 1 = y - x - 1 \\ f'' &= y' - 1 = (-y + x + 2) - 1 = -y + x + 1 \end{aligned}$$

$$f_0 = f(x_0, y_0) = -y_0 + x_0 + 2 \Rightarrow f(0, 2) = -2 + 0 + 2 = 0$$

$$f'_0 = f'(x_0, y_0) = y_0 - x_0 - 1 \Rightarrow f'_0(0, 2) = 2 - 0 - 1 = 1$$

$$x_1 = 0,1$$

$$y_1 = y_0 + h f_0 + \frac{h^2}{2!} f'_0 = 2 + (0,1)(0) + \frac{(0,1)^2}{2!}(1) = 2,0050$$

$$f_1 = f(x_1, y_1) = -y_1 + x_1 + 2 \Rightarrow f(0,1; 2,0050) = -2,0050 + 0,1 + 2 = 0,0950$$

$$x_2 = 0,2$$

$$y_2 = y_0 + 2h f_1 = 2 + 2(0,1)(0,0950) = 2,0190$$

$$f_2 = f(x_2, y_2) = -y_2 + x_2 + 2 \Rightarrow f(0,2; 2,0190) = -2,0190 + 0,2 + 2 = 0,1810$$

$$x_3 = 0,3$$

$$y_3 = y_1 + 2h f_2 = 2,0050 + 2(0,1)(0,1810) = 2,0412$$