Adams-Bashford

edo: $\frac{dy}{dx} = x + y$, $y(0) = 1$ para $x = [0, 1]$

passo $(h) = 0,2$

Euler explícito → achar segundo valor do adam
$y_{i+1} = y_i + f(x, y) \cdot h$
$y_1 = 1 + 1 \cdot 0,2 = 1,2$
$y_0 = 1$, $y_1 = 1,2$

Adam B. $2°$ ordem: Precisa de 2 pontos anteriores
$y_{i+1} = y_i + \frac{h}{2}[3f(x_i, y_i) - f(x_{i-1}, y_{i-1})]$
↳ y_2   ↳ y_1   ↳ y_0
$y_2 = 1,2 + 0,1(3 \cdot 1,4 - 1) = 1,52$

$y_3 = 1,52 + 0,1(3 \cdot 1,92 - 1,4) = 1,956$

$y_4 = 1,956 + 0,1(3 \cdot 2,556 - 1,9) = 2,5308$

$y_5 = 2,5308 + 0,1(3 \cdot 3,3308 - 2,556) = 3,2744$

i	x_i	y_i	
0	0	1	
1	0,2	1,2	→ obtido com Euler
2	0,4	1,52	
3	0,6	1,956	
4	0,8	2,5308	
5	1,0	3,2744	

B) Runge Kutta 4°

$i = 0 \quad X_0 = 0 \quad Y_0 = 1$

$K_1 = f(x_i, y_i) = 1$

$K_2 = f(x_i + \frac{1}{2}h, \quad y_i + \frac{1}{2}K_1 \cdot h) = f(0,1, 1,1) = 1,2$

$K_3 = f(x_i + \frac{1}{2}h, \quad y_i + \frac{1}{2}K_2 \cdot h) = f(0,1, 1,12) = 1,22$

$K_4 = f(x_i + h, \quad y_i + K_3 \cdot h) = f(0,2, 1,244) = 1,444$

$$Y_1 = Y_0 + \frac{1}{6}(K_1 + 2K_2 + 2K_3 + K_4)h = 1,243$$

$i = 1 \quad X = 0,2 \quad Y = 1,243$

$K_1 = f(x_i, y_i) = 1,443$

$K_2 = f(x_i + \frac{1}{2}h^{0,3}, \quad y_i + \frac{1}{2}K_1 \cdot h) = 1,6873$

$K_3 = f(x_i + \frac{1}{2}h, \quad y_i + \frac{1}{2}K_2 \cdot h) = 1,7117$

$K_4 = f(x_i + h, \quad y_i + K_3 \cdot h) = 1,9853$

$$Y_2 = Y_1 + \frac{1}{6}(K_1 + 2K_2 + 2K_3 + K_4)h = 1,584$$

$i = 2 \quad X = 0,4 \quad Y = 1,584$

$K_1 = f(x_i, y_i) = 1,984$

$K_2 = f(x_i + \frac{1}{2}h^{0,5}, \quad y_i + \frac{1}{2}K_1 \cdot h) = 2,2824$

$K_3 = f(x_i + \frac{1}{2}h^{0,5}, \quad y_i + \frac{1}{2}K_2 \cdot h) = 2,3122$

$K_4 = f(x_i + h^{0,6}, \quad y_i + K_3 \cdot h) = 2,6464$

$$Y_3 = Y_2 + \frac{1}{6}(K_1 + 2K_2 + 2K_3 + K_4)h = 2,045$$

i	X	Y	f(i)
0	0	1	f(0) = 1
1	0,2	1,243	f(1) = 1,443
2	0,4	1,584	f(2) = 1,984
3	0,6	2,045	f(3) = 2,645

4   0,8   2,652 $f(4) = 3,452$
5   1,0   3,437

Adams Belfort

$$Y_{i+1} = Y_i + \frac{h}{24}\left[55f_i - 59f_{i-1} + 37_{i-2} - 9f_{i-3}\right]$$

$$Y_4 = Y_3 + \frac{h}{24}\left[55f_3 - 59f_2 + 37f_1 - 9f_0\right] = 2,652$$

$$Y_5 = Y_4 + \frac{h}{24}\left[55f_4 - 59f_3 + 37f_2 - 9f_1\right] = 3,437$$