

Επίλυση συνήθους διαφορικής εξίσωσης πρώτης τάξης με την μέθοδο Euler

$$f(x, y) := -y \qquad y0 := 1 \qquad xspan := \begin{pmatrix} 0 \\ 2 \end{pmatrix} \qquad n := 5$$

$$\text{Euler}(f, xspan, y0, n) := \left(\begin{array}{l} a \leftarrow xspan_0 \\ b \leftarrow xspan_1 \\ h \leftarrow \frac{b - a}{n} \\ x_0 \leftarrow a \\ y_0 \leftarrow y0 \\ \text{for } i \in 1..n \\ \quad x_i \leftarrow a + h \cdot i \\ \text{for } i \in 1..n \\ \quad y_i \leftarrow y_{i-1} + h \cdot f(x_{i-1}, y_{i-1}) \\ s \leftarrow \text{stack}(x^T, y^T) \\ s \end{array} \right)$$

$$B5 := \text{Euler}(f, xspan, y0, n)$$

$$x5 := (B5^T)^{\langle 0 \rangle} \qquad y5 := (B5^T)^{\langle 1 \rangle}$$

$$B5 = \begin{pmatrix} 0 & 0.4 & 0.8 & 1.2 & 1.6 & 2 \\ 1 & 0.6 & 0.36 & 0.216 & 0.13 & 0.078 \end{pmatrix}$$

$$\underline{n} := 10$$

$$B10 := \text{Euler}(f, xspan, y0, n)$$

$$x10 := (B10^T)^{\langle 0 \rangle} \qquad y10 := (B10^T)^{\langle 1 \rangle}$$

B10 =

	0	1	2	3	4	5	6	7	8	9
0	0	0.2	0.4	0.6	0.8	1	1.2	1.4	1.6	1.8
1	1	0.8	0.64	0.512	0.41	0.328	0.262	0.21	0.168	0.134

$$n := 20$$

$$B20 := \text{Euler}(f, \text{xspan}, y0, n)$$

$$x20 := \left(B20^T\right)^{\langle 0 \rangle} \qquad y20 := \left(B20^T\right)^{\langle 1 \rangle}$$

B20 =

	0	1	2	3	4	5	6	7	8	9
0	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
1	1	0.9	0.81	0.729	0.656	0.59	0.531	0.478	0.43	0.387

$$T(t) := e^{-t}$$

$$t := 0,0.1..2$$



