

Επίλυση συνήθους διαφορικής εξίσωσης πρώτης τάξης με την Runge-Kutta 4ης τάξης

$$f(x, y) := -y \qquad y_0 := 1 \qquad xspan := \begin{pmatrix} 0 \\ 2 \end{pmatrix} \qquad n := 5$$

$$R\hat{E}(f, xspan, y_0, n) := \left(\left(\begin{array}{l} a \leftarrow xspan_0 \\ b \leftarrow xspan_1 \\ h \leftarrow \frac{b-a}{n} \\ x_0 \leftarrow a \\ y_0 \leftarrow y_0 \\ \text{for } i \in 1..n \\ \quad x_i \leftarrow a + h \cdot i \\ \text{for } i \in 0..n-1 \\ \quad \left| \begin{array}{l} k1 \leftarrow h \cdot f(x_i, y_i) \\ k2 \leftarrow h \cdot f\left(x_i + \frac{h}{2}, y_i + \frac{k1}{2}\right) \\ k3 \leftarrow h \cdot f\left(x_i + \frac{h}{2}, y_i + \frac{k2}{2}\right) \\ k4 \leftarrow h \cdot f(x_i + h, y_i + k3) \\ y_{i+1} \leftarrow y_i + \frac{k1}{6} + \frac{k2}{3} + \frac{k3}{3} + \frac{k4}{6} \end{array} \right. \\ s \leftarrow \text{stack}((x)^T, (y)^T) \\ s \end{array} \right) \right)$$

$$B5 := R\hat{E}(f, xspan, y_0, n)$$

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

$$B5 = \begin{pmatrix} 0 & 0.4 & 0.8 & 1.2 & 1.6 & 2 \\ 1 & 0.67 & 0.449 & 0.301 & 0.202 & 0.135 \end{pmatrix}$$

$$x5 := \left(B5T\right)^{\langle 0 \rangle} \qquad y5 := \left(B5T\right)^{\langle 1 \rangle}$$

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

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

