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①

3. Runge-Kutta 3 method (1st order derivative) example ([Enter your problem](#))

1. Formula-1 & Example-1
2. [Example-2](#)
3. [Example-3](#)
4. [Formula-2 & Example-1](#)
5. [Example-2](#)
6. [Example-3](#)

Other related methods

1. [Euler method \(1st order derivative\)](#)
2. [Runge-Kutta 2 method \(1st order derivative\)](#)
3. [Runge-Kutta 3 method \(1st order derivative\)](#)
4. [Runge-Kutta 4 method \(1st order derivative\)](#)
5. [Improved Euler method \(1st order derivative\)](#)
6. [Modified Euler method \(1st order derivative\)](#)
7. [Taylor Series method \(1st order derivative\)](#)
8. [Euler method \(2nd order derivative\)](#)
9. [Runge-Kutta 2 method \(2nd order derivative\)](#)
10. [Runge-Kutta 3 method \(2nd order derivative\)](#)
11. [Runge-Kutta 4 method \(2nd order derivative\)](#)

2. Runge-Kutta 2 method (1st order derivative) (Previous method)

2. [Example-2](#) (Next example)

1. Formula-1 & Example-1

Formula

3. Third order R-K method

$$k_1 = hf(x_0, y_0)$$

$$k_2 = hf\left(x_0 + \frac{h}{2}, y_0 + \frac{k_1}{2}\right)$$

$$k_3 = hf\left(x_0 + h, y_0 + 2k_2 - k_1\right)$$

$$y_1 = y_0 + \frac{1}{6}(k_1 + 4k_2 + k_3)$$

Examples



r - v

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Given $y' = \frac{x-y}{2}$, $y(0) = 1$, $h = 0.1$, $y(0.2) = ?$

Third order R-K method

$$k_1 = hf(x_0, y_0) = (0.1)f(0, 1) = (0.1) \cdot (-0.5) = -0.05$$

$$k_2 = hf\left(x_0 + \frac{h}{2}, y_0 + \frac{k_1}{2}\right) = (0.1)f(0.05, 0.975) = (0.1) \cdot (-0.4625) = -0.04625$$

$$k_3 = hf(x_0 + h, y_0 + 2k_2 - k_1) = (0.1)f(0.1, 0.9575) = (0.1) \cdot (-0.42875) = -0.04288$$

$$y_1 = y_0 + \frac{1}{6}(k_1 + 4k_2 + k_3)$$

$$y_1 = 1 + \frac{1}{6}[-0.05 + 4(-0.04625) + (-0.04288)]$$

$$y_1 = 0.95369$$

$$\therefore y(0.1) = 0.95369$$

Again taking (x_1, y_1) in place of (x_0, y_0) and repeat the process

$$k_1 = hf(x_1, y_1) = (0.1)f(0.1, 0.95369) = (0.1) \cdot (-0.42684) = -0.04268$$

$$k_2 = hf\left(x_1 + \frac{h}{2}, y_1 + \frac{k_1}{2}\right) = (0.1)f(0.15, 0.93235) = (0.1) \cdot (-0.39117) = -0.03912$$

$$k_3 = hf(x_1 + h, y_1 + 2k_2 - k_1) = (0.1)f(0.2, 0.91814) = (0.1) \cdot (-0.35907) = -0.03591$$

$$y_2 = y_1 + \frac{1}{6}(k_1 + 4k_2 + k_3)$$

$$y_2 = 0.95369 + \frac{1}{6}[-0.04268 + 4(-0.03912) + (-0.03591)]$$

$$y_2 = 0.91451$$

$$\therefore y(0.2) = 0.91451$$

$$\therefore y(0.2) = 0.91451$$

This material is intended as a summary. Use your textbook for detail explanation.
Any bug, improvement, feedback then [Submit Here](#)

2. Runge-Kutta 2 method (1st order derivative)
(Previous method)

2. Example-2
(Next example)



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