5.1.5 Exam: Implementing a Third-order Runge-Kutta Method

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Exams due Aug 30, 2023 05:00 IST Completed

In this problem, you are to implement the following third-order accurate Runge-Kutta method which we will refer to as RK3. The RK3 method can be written as:

RK3 Method

$$\underline{a} = \Delta t \underline{f}(\underline{v}^n, t^n) \tag{5.4}$$

$$\underline{b} = \Delta t \underline{f}(\underline{v}^n + \underline{a}, t^n + \Delta t) \tag{5.5}$$

$$\underline{c} = \Delta t \underline{f}(\underline{v}^n + \frac{1}{4}\underline{a} + \frac{1}{4}\underline{b}, t^n + \frac{1}{2}\Delta t) \tag{5.6}$$

$$\underline{v}^{n+1} = \underline{v}^n + \frac{1}{6}(\underline{a} + \underline{b} + 4\underline{c}) \tag{5.7}$$

Here are some specifics on what you need to do:

- Your task is to implement the RK3 Method above in the function `step_RK3` in the provided `runge.py` code which is available on the submission site (link given below).
- Please note that `step_RK3` is to be written using NumPy ndarrays as described in the docstring of the provided `runge.py` code.

Problem: Third order Runge Kutta (External resource) (5.0 / 5.0 points)

This will launch an external site that will require forwarding of your username.

Launch external site for submission and grading of Python code

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