3.1.11 Finger Exercise: Implementing the one-step of the Heun Runge-Kutta Method

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Finger Exercises 1 due Aug 3, 2023 05:00 IST Completed

MO2.4 **MO2.7**

In this problem, you are to implement another second-order accurate Runge-Kutta method, this one known as the Heun Method. The Heun Method can be written as:

Heun Method

$$\underline{a} = \Delta t \underline{f}(\underline{v}^n, t^n) \tag{3.7}$$

$$\underline{b} = \Delta t \underline{f}(\underline{v}^n + \underline{a}, t^n + \Delta t) \tag{3.8}$$

$$\underline{v}^{n+1} = \underline{v}^n + \frac{1}{2}(\underline{a} + \underline{b}) \tag{3.9}$$

Here are some specifics on what you need to do:

- Your task is to implement one step of the Heun Method in the function `step_RK2_HEUN` in the provided `runge.py` code which is available on the submission site (link given below).
- Also in the provided `runge.py` code is a correctly implemented version of one step of the Modified Euler Method in the function `step_RK2_ME`. This function takes a single step of the Modified Euler Method (see the docstring for more details).
- Note that the implementations in `runge.py` do not use the `IVP` class. Rather, the `evalf` function is passed directly to the `step_RK2_HEUN` and `step_RK2_ME` functions.

Problem: Runge Kutta Heun (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

SOLUTION: The solution will be available shortly after the due date in Section 3.2.11.

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