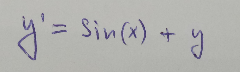
COMPUTATIONAL PRACTICUM assignment

Differential Equations

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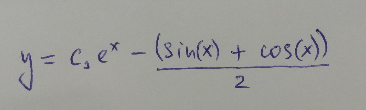
Group: BS17-05

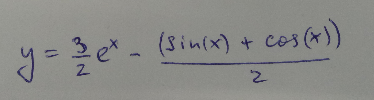
y’ = sin(x) + y

Exact solution of IVP(Initial Value Problem)

there x0 = 0 and y0 = 1

Given Differential Equation:

  
Solution of DE:

Solution of IVP:

There isn’t any point of discontinuity in solution of given differential equation.

System contains 3 classes: Equation, Numeric methods and supporting class Plotting

**UML diagram for Equation and Numeric methods**

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| --- |
| **Equation** |
| **+x0 : Float**  **+y0 : Float**  **+X : Float**  **+n : Integer**  **+h : Integer** |
| **+get\_derivative(x : Float, y : Float)**  **+\_\_init\_\_(x0 : Float, y0 : Float, X : Float, n : Integer)**  **+local\_errors(ff : Equation)**  **+max\_error(ff : Equation)**  **+exact\_solution()** |

|  |
| --- |
| **Numeric methods** |
|  |
| **+euler\_method(f : Equation)**  **+euler\_method\_improved(f : Equation)**  **+runge\_kutta\_method(f : Equation)**  **+total\_approximation\_errors(start\_n : Integer, end\_n : Integer, x0 : Float, y0 : Float, X : Float)** |

**Explanation of Equation class attributes and methods**

**Equation class is used to operate with given y’ = sin(x) + y differential equation, change initial values, grid size to solve IVP inside class.**

**Attributes:**

**+x0 : Float Starting point of x-axis of IVP problem segment**

**+y0 : Float Value of function in x0 point y(x0) = y0**

**+X : Float Ending point of x-axis of IVP problem segment**

**+n : Integer Grid size**

**+h : Integer Value of one grid step(depends on x0, X0 and n)**

**Methods:**

**+\_\_init\_\_(x0 : Float, y0 : Float, X : Float, n : Integer)**

**Method initialize initital values, scope and grid size for solving IVP problem, these values are assigned to Equation instance**

**+get\_derivative(x : Float, y : Float)**

**+local\_errors(ff : Equation)**

**+max\_error(ff : Equation)**

**+exact\_solution()+get\_derivative(x : Float, y : Float**