COURSE TITLE: NUMERICAL ANALYSIS II

COURSE CODE: MTH 301

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QUESTION

1. Draw a flow chart illustrating Euler's method
2. Write a program on it with any programming language of your choice
3. Use your program to test at least two eulers problems and references

SOLUTION:

*# Function to calculate euler's method*def euler\_method(f, x0, y0, xn, h):  
 n = int((xn - x0) / h)  
 for i in range(n):  
 eqn = f(x0, y0)  
 yn = y0 + h \* eqn  
 y0 = yn  
 x0 = x0 + h  
 print(f"\nValue of y at x = {x0:.4f} is {yn:.4f}""\n")  
  
*# Example usage*def ex1(x, y):  
 return (x - y)/2  
  
print("Example 1: ")  
print("dy/dx = (x - y)/2")  
print("\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_")  
x1 = float(input("Enter initial value for x (Xo): "))  
y1 = float(input("Enter initial value for y (Yo): "))  
xi = float(input("Enter final value for x (Xn): "))  
h1 = float(input("Enter the step size(h): "))  
  
euler\_method(ex1, x1, y1, xi, h1)  
  
*# Example usage 2*def ex2(x, y):  
 return x\*(y\*\*2)  
  
print("Example 2: ")  
print("dy/dx = x\*(y\*\*2)")  
print("\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_")  
x2 = float(input("Enter initial value for x (Xo): "))  
y2 = float(input("Enter initial value for y (Yo): "))  
xk = float(input("Enter final value for x (Xn): "))  
h2 = float(input("Enter the step size(h): "))  
  
euler\_method(ex2, x2, y2, xk, h2)

OUTPUT:

C:\Users\damil\anaconda3\python.exe C:\Users\damil\PycharmProjects\pythonProject1\eulerperplex.py

Example 1:

dy/dx = (x - y)/2

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Enter initial value for x (Xo): 0

Enter initial value for y (Yo): 1

Enter final value for x (Xn): 0.2

Enter the step size(h): 0.1

Value of y at x = 0.2000 is 0.9075

Example 2:

dy/dx = x\*(y\*\*2)

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Enter initial value for x (Xo): 0

Enter initial value for y (Yo): 0.5

Enter final value for x (Xn): 2.0

Enter the step size(h): 0.5

Value of y at x = 2.0000 is 1.1103

Process finished with exit code 0

REFERENCES OF THE EXAMPLES:

<https://atozmath.com/example/CONM/RungeKutta.aspx?he=e>

<https://study.com/skill/learn/how-to-use-eulers-method-to-approximate-a-solution-for-a-point-on-a-solution-curve-of-a-differential-equation-explanation.html>