

## Practical 5: Solution of Differential Equation

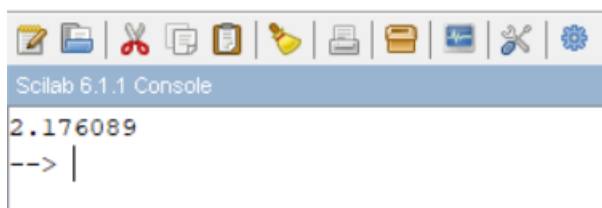
### (a) Program to solve differential equation using Euler's Method.

**Problem Statement:** Solve the following differential equation to find  $y(0.2)$  using Euler's Method. Given  $dy/dx = y - xy + x$  and  $y(0) = 1$ .

**Scilab Code:**

```
clc;
clear;
function [y0]=eular(x0, y0, h, yest, f)
    n=(yest-x0)/h;
    for i=1:n
        y0=y0+f(x0,y0)*h;
        x0=x0+h;
        y0
    end
endfunction
deff('[y]=f(x,y)','y=y-x*y+x');
printf("%f",eular(0,1,0.2,1,f));
```

**Output:**



### (b) Program to solve differential equation using Modified Euler's Method.

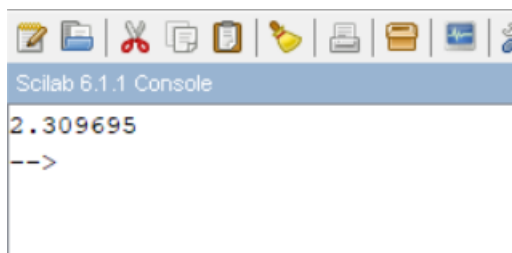
**Problem Statement:** Write and execute Scilab code for the following :

Solve the following equation  $dy/dx = \log(x+y)$  using Modified Euler Method. Given  $y(1) = 2$ . Find  $y(0.2)$ .

### Scilab Code:

```
clc;
clear;
function [y10]=eularmod(x0, y0, h, n, f)
    x1=x0+h;
    y10=y0-h*f(x0,y0);
    while(n>1)
        x0=x0+h;
        x1=y10;
        y10=y0+(h/2)*(f(x0,y0)+f(x1,y10))
        if(abs(y10-x1)<0.00001)
            y10
            abort;
        end
        n=n-1
        y10
    end
endfunction
deff('[y]=f(x,y)','y=log(x+y)');
printf("%f",eularmod(1,2,0.2,10,f));
```

### Output:



### (c) Program to solve differential equation using RUNGA KUTTA of order 2 and order 4.

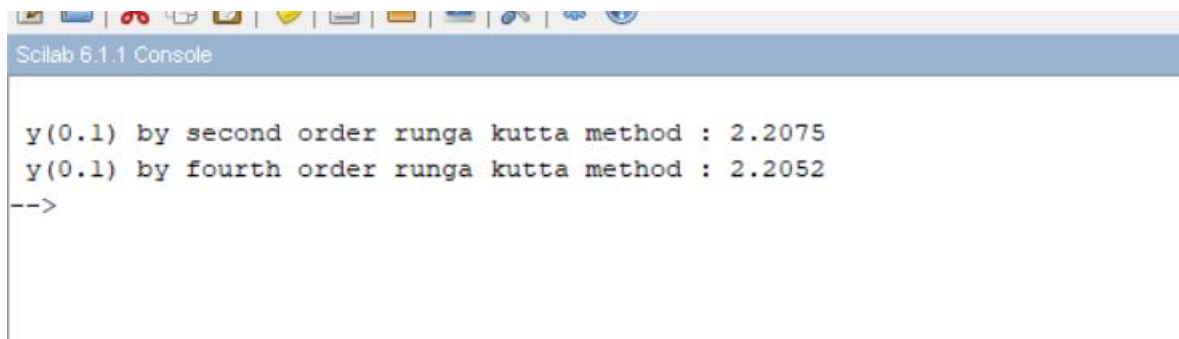
**Problem Statement:** Write and execute Scilab code for the following :

Determine the value of  $y$  when  $x=0.1$  using RUNGA KUTTA Method order 2 and RUNGA KUTTA Method order 4. Given that  $y(0)=2$  and  $dy/dx=y-x$ . Take  $h=0.1$ .

### Scilab Code:

```
clc;
clear;
deff('y=f(x,y)','y=y-x');
y=2;x=0;h=0.1;
K1=h*f(x,y);
K2=h*f(x+h/2,y+K1);
y1=y+( K1+K2)/2
printf('\n y(0.1) by second order runga kutta method : %0.4f',y1);
K1=h*f(x,y);
K2=h*f(x+h/2,y+K1/2);
K3=h*f(x+h/2,y+K2/2);
K4=h*f(x+h,y+K3);
y1=y+((K1+2*K2+2*K3+K4)/6);
printf('\n y(0.1) by fourth order runga kutta method : %0.4f',y1);
```

### Output:

A screenshot of the Scilab 6.1.1 Console window. The window has a title bar with standard OS icons and a menu bar. The console area shows the output of the code: 'y(0.1) by second order runga kutta method : 2.2075' and 'y(0.1) by fourth order runga kutta method : 2.2052'. The prompt '-->' is visible at the bottom left of the console area.

```
Scilab 6.1.1 Console

y(0.1) by second order runga kutta method : 2.2075
y(0.1) by fourth order runga kutta method : 2.2052
-->
```