Practical 5: Solution of Differential Equation

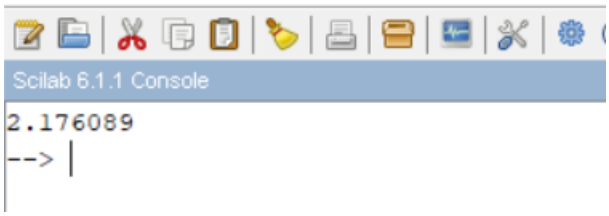
(a) Program to solve differential equation using Euler's Method.

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.

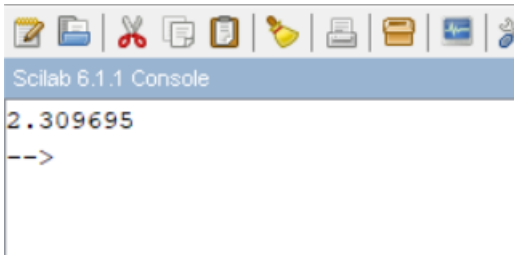
Problem Statement: Write and execute Scilab code for the following :

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: