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# **Raport**

Lucrarea de laborator nr. 4

Disciplina: Metode si modele de calcul.

Tema: Integrarea numerica a ecuatiilor diferentiale.

**Efectuat:**

**Verificat:**

Chișinău 2019

## Tema: Integrarea numerica a ecuatiilor diferentiale.

### Scopul lucrării:

1. Sa se determine solutia problemei Cauchy pe segmental indicat [a,b] prin metodele Euler, Euler modificat si Runge-Kutta cu pasul  $h=0.05$ ;
2. Sa se efectueze o analiza a rezultatelor obtinute.

### Codul sursa al programului :

```
#include <iostream.h>
#include <iomanip.h>
#include <conio.h>
#include <math.h>
#include <windows.h>
void Color(int couleurDuTexte,int couleurDeFond)
{
    HANDLE H = GetStdHandle(STD_OUTPUT_HANDLE);
    SetConsoleTextAttribute(H,couleurDeFond*16+couleurDuTexte);
}
void Color(int couleurDuTexte,int couleurDeFond);
double f(double,double);
double Euler(double,double,double);
double EulerModificata(double,double,double,double);
double Runge_Kutta(double,double,double);

void main(void)
{
    clrscr();
    double a,b,h,x0,y0,y1,y2,y3;
    Color(3,0);
    cout<<"Dati a si b:\n";
    cout<<"a=";
    cin>>a;
    cout<<"b=";
    cin>>b;
    cout<<"Dati pasul h:\n";
    cin>>h;
    Color(2,0);
    cout<<"Dati x0 si y0:\n";
    cout<<"x0=";
    cin>>x0;
    cout<<"y0=";
    cin>>y0;
    y1=y2=y3=y0;
    Color(12,0);
    cout<<setw(6)<<"xi"<<" Metoda Metoda Metoda\n";
    cout<<" "<<setw(10)<<"Euler"<<" "
        <<setw(16)<<"Euler Modificata"<<" "
        <<setw(10)<<"Runge_Kutta"<<endl;
    for (x0+=h;x0-h<b;x0+=h)
    {
        y1=Euler(x0,y1,h);
        y2=EulerModificata(x0,x0+h,y2,h);
        y3=Runge_Kutta(x0,y3,h);
        cout<<setw(6)<<x0<<" "<<setw(10)<<y1<<" "
            <<setw(13)<<y2<<" "
            <<setw(14)<<y3<<endl;
    };
    getch();
};
Return 1+0,5ysin(x)-0,75y^2;
};

double Euler(double x,double y,double h)
{
    return y+h*f(x,y);
}
```

```

};

double EulerModificata(double x,double x1,double y,double h)
{
    return y+h*(f(x,y)+f(x1,Euler(x,y,h)))/2;
};

double Runge_Kutta(double x,double y,double h)
{
    double k1,k2,k3,k4,delta_y;
    k1=h*f(x,y);
    k2=h*f(x+h/2,y+k1/2);
    k3=h*f(x+h/2,y+k2/2);
    return y+(k1+2*k2+2*k3)/6;
}

```

Exemplu de rezultate:

xi	Metoda Euler	Metoda Euler Modificata	Metoda Runge_Kutta
0.05	0.0614151	0.0605933	0.0593217
0.1	0.121187	0.11963	0.118839
0.15	0.179408	0.177195	0.178565
0.2	0.236166	0.233372	0.238513
0.25	0.291546	0.288238	0.298696
0.3	0.345626	0.341867	0.359123
0.35	0.398483	0.394328	0.419808
0.4	0.450186	0.445688	0.480758
0.45	0.500802	0.49601	0.541984
0.5	0.550395	0.54535	0.603496
0.55	0.599023	0.593766	0.6653
0.6	0.646743	0.641308	0.727404
0.65	0.693606	0.688027	0.789816
0.7	0.739663	0.733968	0.852541
0.75	0.784959	0.779176	0.915585
0.8	0.829538	0.82369	0.978954
0.85	0.873441	0.86755	1.04265
0.9	0.916707	0.910792	1.10668
0.95	0.959372	0.95345	1.17104
1	1.00147	0.995556	1.23574

Concluzie : In aceasta lucrare de laborator am facut cunostinta cu metodele de integrare numerica accuatiilor diferentiale. Analizind rezultatele obtinute am observat ca metoda Runge-Kutta si metoda Euler modificată dau rezultate mai bune.