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#include<stdio.h>
#include<math.h>
#include<stdlib.h>
double funcao(double x,double y){ // Calcula o valor da função no ponto x e y
    double f=4-x+(2*y);
    return f;
}
double exata(double x){ //valor da solução exata no ponto x
    double e=exp(2*x);
    double y=((-1.75)+(0.5*x)+(2.75)*e);
    return y;
}
double erro(double exata,double y){ //calcula o erro absoluto
    double e= exata -y;
    if(e<0){
        e=e*-1;
    }
    return e;
}
void metodo_euler(double a,double b,double h,double x0,double y0){ // aplica o
metodo de euler aperfeiçoado
    int m=(b-a)/h;
    printf("X      |EULER      |EXATA      |ERRO ABSOLUTO\n");
    for(int i=0; i<m; i++){
        y0=(y0 +(h/2)*((funcao(x0,y0)) + (funcao((x0+h),(y0 + (h*(funcao
(x0,y0))))))));
        x0=x0+h;
        printf("%.2f |%.5f |%.5f |%.5f \n",x0,y0,exata(x0),erro(exata
(x0),y0));
    }
    printf("\n\n");
}
double fk1(double h,double x,double y){ //calcula o k1
    double k=(funcao(x,y));
    return k;
}
double fk(double h,double x,double y,double k){ //calcula o k2 e k3
    double k2=(funcao((x+(h/2)),(y+((h/2)*k))));
    return k2;
}
double fk4(double h,double x,double y,double k){ //calcula o k4
    double k4=(funcao((x+h),(y+(k*h))));
}
double metodo_runge_kutta(double a,double b,double h,double x0,double y0){ //
aplica o metodo de runge-kutta
    int m=(b-a)/h; double k1,k2,k3,k4;
    printf("X      |RUNGE-KUTTA      |EXATA |K1      |K2      |K3      |K4      |ERRO ABSOLUTO
\n");
    for(int i=0; i<m; i++){
        k1=fk1(h,x0,y0);
        k2=fk(h,x0,y0,k1);
        k3=fk(h,x0,y0,k2);
        k4=fk4(h,x0,y0,k3);
        y0= (y0 + ((h/6)*(k1 + (2*k2) + (2*k3) + k4)));
        x0=x0+h;
        printf("%.2f |%.5f |%.5f |%.5f |%.5f |%.5f |%.5f |%.5f \n",x0,y0,exata
(x0),k1,k2,k3,k4,erro(exata
(x0),y0));
    }
    printf("\n\n");
}

double main(){
    metodo_euler(0,1,0.1,0,1); // chama o a função que realiza o metodo, passando
os intervalos, passo e x0 e y1
    metodo_euler(0,1,0.05,0,1);
}

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    metodo_runge_kutta(0,2,0.1,0,1);  
    metodo_runge_kutta(0,2,0.05,0,1);  
}
```