**Явный Эйлер**

package mcha\_3\_1;

import java.text.NumberFormat;

public class Mcha\_3\_1 {

public static double FCalculation(double x, double y){

double res ;

res = y-Math.sqrt(y\*y+x\*x)+x-1;

return res;

}

public static void main(String[] args) {

int stop=5;

NumberFormat formatter = NumberFormat.getNumberInstance();

formatter.setMaximumFractionDigits(stop);

double x0=1;double xf=2;

double y=1;//y[0]=1

double y2=1;

double h = 0.1;

double x=x0;

int i=1;

boolean go=true;

while(go){

y2=y+(h)\*FCalculation(x,y);

x=x0+i\*h;

i=i+1;

y=y2;

System.out.println("x= "+x+", y= "+formatter.format(y));

if(Math.abs(xf-x)<h/2){

go=false;

} } } }

**Неявный Эйлер**

package mcha\_3\_2;

import java.text.NumberFormat;

public class Mcha\_3\_2 {

public static double FCalculation(double x, double y){

double res ;

res = y-Math.sqrt(y\*y+x\*x)+x-1;

return res;

}

public static double NbutonFuncCalculation(double y,double x,double yprev,double h){

double F = y-yprev-h\*FCalculation(x,y);

return F;

}

public static double NbutonMethodCycle(double yG, double x, double h){

double y=yG+h\*FCalculation(x,yG);double yprev=yG;

double delta = Math.abs(y-yprev);

while(delta>h\*h){

double yJ=y;

y=y-NbutonFuncCalculation(y,x,yprev,h)/(1-h\*FCalculation(x,y));

delta =Math.abs(y-yJ);

}

return y;

}

public static void main(String[] args) {

int stop=5;

NumberFormat formatter = NumberFormat.getNumberInstance();

formatter.setMaximumFractionDigits(stop);

double x0=1;double xf=2;

double h=0.1;

double x = x0;

double y=1;

double yprev=y;

double ysave;

boolean go=true;

int i=1;

while(go){

ysave = y;

x=x0+i\*h;

i=i+1;

y=NbutonMethodCycle(y,x,h);

yprev = ysave;

System.out.println("x= "+x+", y= "+formatter.format(y));

if(Math.abs(x-xf)<h/2)

{

go=false;

} } }}

**МПППТ**

package mcha\_3\_3;

import java.text.NumberFormat;

public class Mcha\_3\_3 {

//метод последовательного повышения порядка точности

//- формула средних прямоугольников

public static double FCalculation(double x, double y){

double res ;

res = y-Math.sqrt(y\*y+x\*x)+x-1;

return res;

}

public static void main(String[] args) {

int stop=5;

NumberFormat formatter = NumberFormat.getNumberInstance();

formatter.setMaximumFractionDigits(stop);

double x0=1;

double xf=2;

double y=1;//y[0]=1

double y2=1;

double h = 0.1;

double x=x0;

double halfH = h/2;

boolean go=true;

int i=1;

while(go){

double preY = y+(halfH)\*FCalculation(x,y);

y = y +h\*FCalculation(x+halfH,preY);

x=x0+i\*h;

i=i+1;

System.out.println("x= "+x+", y= "+formatter.format(y));

if(Math.abs(x-xf)<h/2){

go=false;

} } }}

**Рунге-Кутт**

package mcha\_3\_4;

import java.text.NumberFormat;

public class Mcha\_3\_4 {

public static double FCalculation(double x, double y){

double res ;

res = y-Math.sqrt(y\*y+x\*x)+x-1;

return res;

}

public static void main(String[] args) {

int stop=5;

NumberFormat formatter = NumberFormat.getNumberInstance();

formatter.setMaximumFractionDigits(stop);

double x0=1;double xf=2;

double y=1;//y[0]=1

double y2=1;

double h = 0.1;

double x=x0;double halfH = h/2;

double C = 1.0/6.0;

boolean go=true;int i=1;

while(go){

x=x0+i\*h;

double f0=h\*FCalculation(x,y);

double f1=h\*FCalculation(x+h/2,y+f0/2);

double f2=h\*FCalculation(x+h,y-f0+2\*f1);

y=y+C\*(f0+4\*f1+f2);

System.out.println("x= "+x+", y= "+formatter.format(y));

i++;

if(Math.abs(x-xf)<h/2){

go=false;

} } }}

**ЭМА**

package mcha\_3\_5;

import java.text.NumberFormat;

public class Mcha\_3\_5 {

public static double FCalculation(double x, double y){

double res ;

res = y-Math.sqrt(y\*y+x\*x)+x-1;

return res;

}

public static void main(String[] args) {

int stop=5;

NumberFormat formatter = NumberFormat.getNumberInstance();

formatter.setMaximumFractionDigits(stop);

double x0=1;double xf=2;

double y=1;//y[0]=1

double y2=1;

double h = 0.1;

double x=x0;double halfH = h/2;

double S = 1.0/12.0;

int i=1;

double []YVector = new double [3];

YVector[0]=y;

while(i<=2){

x=x0+i\*h;

double f0=h\*FCalculation(x,y);

double f1=h\*FCalculation(x+h/2,y+f0/2);

double f2=h\*FCalculation(x+h,y-f0+2\*f1);

y=y+2\*S\*(f0+4\*f1+f2);

System.out.println("x="+x+", y="+formatter.format(y));

YVector[i]=y;

i++;

}

boolean go=true;

while(go){

x=x0+i\*h;

i++;

double A = 23\*FCalculation(x,YVector[2]);

double B=16\*FCalculation(x-h,YVector[1]);

double C=5\*FCalculation(x-2\*h,YVector[0]);

double delta = S\*h\*(A-B+C);

double newY = YVector[2]+delta;

YVector[0]=YVector[1];

YVector[1]=YVector[2];

YVector[2]=newY;

System.out.println("x= "+x+", y= "+formatter.format(YVector[2]));

if(Math.abs(x-xf)<h/2){

go=false;

} } }}