**Листинг программы:**

**package mcha\_1\_1;**

**public class Mcha\_1\_1 {**

**public static class Lab {**

**private double e;**

**private double a;**

**private double b;**

**public Lab() {**

**e = Math.pow(10, -5);**

**a = 1;**

**b = 2;**

**}**

**private double F(double x) {**

**return Math.log(x) / x;**

**}**

**public double N\_MiddleRectangle() {**

**return Math.ceil(Math.pow((Math.pow(b - a, 3) \* (0.125) / (24 \* e)), 0.5));**

**}**

**private double rMiddleRectangle(double h){**

**double answer = 0;**

**answer = (Math.pow(h,2)\*(b-a)\* (0.125))/24;**

**return answer;**

**}**

**public double middleRectangleMethod() {**

**double answer = 0;**

**double N = N\_MiddleRectangle();**

**double h = (b - a) / N;**

**for (int i = 0; i < N; i++) {**

**answer += F(a + i \* h + h / 2);**

**}**

**answer \*= h;**

**System.out.println("N middle rectangle method: " + N);**

**System.out.println("h middle rectangle method: " + h);**

**System.out.println("R middle rectangle method: " + rMiddleRectangle(h));**

**return answer;**

**}**

**public double rightRectangleMethod(double N, double h) {**

**double answer = 0;**

**for (int i = 1; i <= N; i++) {**

**answer += F(a + i \* h);**

**}**

**answer \*= h;**

**return answer;**

**}**

**private int getFactorial(int num) {**

**int answer = 1;**

**for (int i = 0; i < num; i++) {**

**answer \*= num - i;**

**}**

**return answer;**

**}**

**private double getDerivetive(int k) {**

**switch (k) {**

**case 0:**

**return 0.347;**

**case 1:**

**return 1;**

**case 2:**

**return -0.125;**

**case 3:**

**return 11;**

**case 4:**

**return -1;**

**}**

**return k;**

**}**

**public double getRGauss(int n) {**

**double R = 0;**

**double a = (Math.pow(2, 2 \* n + 3) / ((2 \* n + 3) \* getFactorial(2 \* n + 2)));**

**double b1 = getFactorial(n + 1);**

**double b2 = getFactorial(2 \* n + 2);**

**double b = Math.pow(b1 / b2, 2);**

**double c = getDerivetive(2 \* n + 2);**

**R = Math.abs(a \* b \* c);**

**return R;**

**}**

**public int getNumOfPoints() {**

**int n = 0;**

**while (getRGauss(n) >= e) {**

**n++;**

**}**

**return n + 1;**

**}**

**private double newFunction(double t) {**

**return (Math.log((t+3)/2))/(t+3);**

**}**

**public double GaussFormula() {**

**int n = getNumOfPoints();**

**System.out.println("Number of Gauss points: " + n);**

**System.out.println("R Gauss: " + getRGauss(n));**

**double answer = 1 \* newFunction(-0.5773503) + 1 \* newFunction(0.5773503);**

**return answer;**

**}**

**private double rungeR(double h1, double h2, double N1, double N2){**

**return Math.abs((rightRectangleMethod(N1, h1) - rightRectangleMethod(N2, h2)) / (1 - h2 / h1));**

**}**

**public double RungeMethod(){**

**double h1 = 0.5;**

**double h2 = h1 / 2;**

**int N1 = (int)((b-a)/h1);**

**int N2 = (int)((b-a)/h2);**

**while(rungeR(h1, h2, N1, N2) >= e){**

**h1 = h2;**

**h2 = h1 / 2;**

**N1 = (int)((b-a)/h1);**

**N2 = (int)((b-a)/h2);**

**}**

**System.out.println("R Runge: " + rungeR(h1,h2,N1,N2));**

**System.out.println("N Runge: " + N2);**

**System.out.println("h Runge: " + h2);**

**return rightRectangleMethod(N2, h2);**

**}**

**}**

**public static void main(String[] args) {**

**Lab l = new Lab();**

**System.out.println("Integral Runge: " + l.RungeMethod() + "\r\n");**

**System.out.println("Integral Gauss: " + l.GaussFormula() + "\r\n");**

**System.out.print("Integral Middle Rectangle: " + l.middleRectangleMethod());**

**}**

**}**

**Листинг программы 2:**

**package mcha\_1\_2;**

**public class Mcha\_1\_2 {**

**public static double D2func (double x){**

**double res = (2\*Math.log(x)-3)/(Math.pow(x,3));**

**return res;**

**}**

**public static double D4func (double x){**

**double res = (24\*Math.log(x)-50)/(Math.pow(x,5));**

**return res;**

**}**

**public static double func (double x){**

**double res = Math.log(x)/x;**

**return res;**

**}**

**public static void main(String[] args) {**

**double a=1;**

**double b= 2;**

**double E = 0.00001;**

**double h =Math.sqrt((-1)\*(12\*E)/(D2func(0.1)\*(b-a)));**

**System.out.println("M2="+D2func(0.1));**

**h=h/100;**

**System.out.println("H1="+h);**

**double Its=0;**

**Its=h\*(func(a)+func(b))\*0.5;**

**for(int i=1;i<(b-a)/h;i++){**

**Its=Its+h\*func(a+i\*h);**

**}**

**double N = (b-a)/h;**

**System.out.println("N="+N);**

**System.out.println("I(trapecii)="+Its);**

**}**

**}**