// deriv.java - approximate derivative function

public class deriv1a

{

static double f(double x)

{

return x\*x\*x - 2.0\*x\*x + 3.0\*x - 8.0;

} // f

static double real\_fderiv(double x)

{

return 3.0\*x\*x - 4.0\*x + 3.0;

} // f

static double approx\_fderiv(double x, double eps)

{

double h, fd0, fd1;

double f1, f2;

h = x/2.0;

fd1 = (f(x+h) - f(x-h))/(2\*h);

do {

fd0 = fd1;

h = h/2.0;

fd1 = (f(x+h) - f(x-h))/(2\*h);

f1 = f(x+h);

f2 = f(x-h);

System.out.println("fd0 = " + fd0 +",fd1 = "+ fd1);

} while(Math.abs(fd0 - fd1) > eps );

return fd1;

} // approx\_deriv

static public void main(String args[])

{

System.out.println("approx\_deriv(5.0) = " +

approx\_fderiv(5.0,0.0001));

System.out.println("real\_fderiv(5.0) = " +

real\_fderiv(5.0));

} // main

} // deriv1a.java

פלט ריצה:

fd0 = 64.25,fd1 = 59.5625

fd0 = 59.5625,fd1 = 58.390625

fd0 = 58.390625,fd1 = 58.09765625

fd0 = 58.09765625,fd1 = 58.0244140625

fd0 = 58.0244140625,fd1 = 58.006103515625

fd0 = 58.006103515625,fd1 = 58.00152587890625

fd0 = 58.00152587890625,fd1 = 58.00038146972656

fd0 = 58.00038146972656,fd1 = 58.00009536743164

fd0 = 58.00009536743164,fd1 = 58.00002384185791

approx\_deriv(5.0) = 58.00002384185791

real\_fderiv(5.0) = 58.0

// fderiv1a.c - approximate derivative function

public class fderiv1a

{

static final double PI = 3.14159265;

static double f(double x)

{

return Math.sin(x);

} // f

static double approx\_fderiv(double x)

{

double h, fd0, fd1, fd2;

if( x == 0)

h = 1/2.0;

else

h = x/2.0;

fd1 = (f(x+h) - f(x-h))/(2\*h);

h = h/2.0;

fd2 = (f(x+h) - f(x-h))/(2\*h);

do {

fd0 = fd1;

fd1 = fd2;

h = h/2.0;

fd2 = (f(x+h) - f(x-h))/(2\*h);

} while(Math.abs(fd0 - fd1) > Math.abs(fd1 - fd2) );

return fd1;

} // approx\_deriv

public static void main(String args[])

{

System.out.println("approx\_deriv(0.0) = " + approx\_fderiv(PI/6.0));

System.out.println("real\_fderiv(0.0) = " + Math.cos(PI/6.0));

} // main

} // fderiv1a

פלט ריצה:

approx\_deriv(0.0) = 0.8660254040912695

real\_fderiv(0.0) = 0.8660254040835881

// deriv2a.java

abstract class deriv

{

public abstract double f(double x);

double approx\_deriv(double x, double eps)

{

double h, fd0, fd1;

double f1, f2;

h = x/2.0;

fd1 = (f(x+h) - f(x-h))/(2\*h);

do {

fd0 = fd1;

h = h/2.0;

fd1 = (f(x+h) - f(x-h))/(2\*h);

f1 = f(x+h);

f2 = f(x-h);

System.out.println("fd0 = " + fd0 +",fd1 = "+ fd1);

} while(Math.abs(fd0 - fd1) > eps );

return fd1;

} // approx\_deriv

} //deriv

class myfun extends deriv

{

public double f( double x)

{

return (x\*x\*x - 100.0);

} /\* poly \*/

public double real\_deriv( double x)

{

return (3\*x\*x);

} /\* poly \*/

} //myfun

public class deriv2a

{

public static void main(String[] args)

{

double x;

myfun tr100 = new myfun();

System.out.println("approx\_deriv(5.0) = " +

tr100.approx\_deriv(5.0, 0.0000001));

System.out.println("real\_deriv(5.0) = " +

tr100.real\_deriv(5.0));

} // main

}// deriv2a

פלט ריצה:

fd0 = 81.25,fd1 = 76.5625

fd0 = 76.5625,fd1 = 75.390625

fd0 = 75.390625,fd1 = 75.09765625

fd0 = 75.09765625,fd1 = 75.0244140625

fd0 = 75.0244140625,fd1 = 75.006103515625

fd0 = 75.006103515625,fd1 = 75.00152587890625

fd0 = 75.00152587890625,fd1 = 75.00038146972656

fd0 = 75.00038146972656,fd1 = 75.00009536743164

fd0 = 75.00009536743164,fd1 = 75.00002384185791

fd0 = 75.00002384185791,fd1 = 75.00000596046448

fd0 = 75.00000596046448,fd1 = 75.00000149011612

fd0 = 75.00000149011612,fd1 = 75.00000037252903

fd0 = 75.00000037252903,fd1 = 75.00000009313226

fd0 = 75.00000009313226,fd1 = 75.00000002328306

approx\_deriv(5.0) = 75.00000002328306

real\_deriv(5.0) = 75.0

// deriv3a.java - fderiv's method

interface DoubleFunction

{

public double f(double x);

} // DoubleFunction

class deriv

{

double approx\_deriv(DoubleFunction df, double x, double eps)

{

double h, fd0, fd1;

double f1, f2;

h = x/2.0;

fd1 = (df.f(x+h) - df.f(x-h))/(2\*h);

do {

fd0 = fd1;

h = h/2.0;

fd1 = (df.f(x+h) - df.f(x-h))/(2\*h);

f1 = df.f(x+h);

f2 = df.f(x-h);

System.out.println("fd0 = " + fd0 +",fd1 = "+ fd1);

} while(Math.abs(fd0 - fd1) > eps );

return fd1;

} // approx\_deriv

} //deriv

class x3100 implements DoubleFunction

{

public double f( double x)

{

return (x\*x\*x - 100.0);

} // fun

} // x3100

public class deriv3a

{

static public double x3100Derivative( double x)

{

return (3\*x\*x);

} // f

public static void main(String[] args)

{

double x;

x3100 tr100 = new x3100();

deriv nt = new deriv();

System.out.println("approx\_deriv(5.0) = " +

nt.approx\_deriv(tr100, 5.0, 0.0000001));

System.out.println("real\_deriv(5.0) = " +

x3100Derivative(5.0));

} // main

}// deriv3a

פלט ריצה:

fd0 = 81.25,fd1 = 76.5625

fd0 = 76.5625,fd1 = 75.390625

fd0 = 75.390625,fd1 = 75.09765625

fd0 = 75.09765625,fd1 = 75.0244140625

fd0 = 75.0244140625,fd1 = 75.006103515625

fd0 = 75.006103515625,fd1 = 75.00152587890625

fd0 = 75.00152587890625,fd1 = 75.00038146972656

fd0 = 75.00038146972656,fd1 = 75.00009536743164

fd0 = 75.00009536743164,fd1 = 75.00002384185791

fd0 = 75.00002384185791,fd1 = 75.00000596046448

fd0 = 75.00000596046448,fd1 = 75.00000149011612

fd0 = 75.00000149011612,fd1 = 75.00000037252903

fd0 = 75.00000037252903,fd1 = 75.00000009313226

fd0 = 75.00000009313226,fd1 = 75.00000002328306

approx\_deriv(5.0) = 75.00000002328306

real\_deriv(5.0) = 75.0