התוכנית הבאה מבצעת אינטרפולציה לינארית על נקודות של הפונקציה

f(x) = x2

ומשווה תוצאות לערך האמיתי:

/\* li.java - implement linear interpolation/spline \*/

class Point

{

double x;

double fx;

}

class Li\_rec

{

int n; /\* no\_of\_points \*/

Point point\_arr[];

} //Li\_rec

public class li

{

static int bin\_search(Li\_rec li\_r, double x)

{

int low, high, mid;

low = 0;

high = li\_r.n - 1;

while(true)

{

mid = (low+high)/2;

if (li\_r.point\_arr[mid].x == x)

return mid;

if (li\_r.point\_arr[mid+1].x == x)

return mid+1;

if ( (li\_r.point\_arr[mid].x < x) &&

(li\_r.point\_arr[mid+1].x > x))

return mid;

if( li\_r.point\_arr[mid+1].x < x )

low = mid+1;

else /\* li\_r.point\_arr[mid].x > x \*/

high = mid-1;

} /\* while \*/

} /\* bin\_search \*/

static double interpolate(Li\_rec li\_rec, double x)

{

int i;

double t;

i = bin\_search(li\_rec, x);

t = (li\_rec.point\_arr[i+1].fx - li\_rec.point\_arr[i].fx);

t = t/(li\_rec.point\_arr[i+1].x - li\_rec.point\_arr[i].x);

t = t\*(x - li\_rec.point\_arr[i].x);

t = li\_rec.point\_arr[i].fx + t;

return t;

} /\* interpolate \*/

static double my\_sqr( double x)

{

return x\*x;

} /\* my\_sqr \*/

static public void main(String args[])

{

Li\_rec li\_r = new Li\_rec();

double x;

int i, noOfPoints = 8;

li\_r.n = 8;

li\_r.point\_arr = new Point[noOfPoints];

for(i=0;i < noOfPoints; i++)

li\_r.point\_arr[i] = new Point();

li\_r.point\_arr[0].x = 0.0;

li\_r.point\_arr[0].fx = 0.0;

li\_r.point\_arr[1].x = 1.0;

li\_r.point\_arr[1].fx = 1.0;

li\_r.point\_arr[2].x = 2.0;

li\_r.point\_arr[2].fx = 4.0;

li\_r.point\_arr[3].x = 3.0;

li\_r.point\_arr[3].fx = 9.0;

li\_r.point\_arr[4].x = 4.0;

li\_r.point\_arr[4].fx = 16.0;

li\_r.point\_arr[5].x = 5.0;

li\_r.point\_arr[5].fx = 25.0;

li\_r.point\_arr[6].x = 6.0;

li\_r.point\_arr[6].fx = 36.0;

li\_r.point\_arr[7].x = 7.0;

li\_r.point\_arr[7].fx = 49.0;

x = 1.5;

System.out.println("x = " + x + ", real value = " + my\_sqr(x) +

" interpolation = " + interpolate(li\_r, x));

x = 2.5;

System.out.println("x = " + x + ", real value = " + my\_sqr(x) +

" interpolation = " + interpolate(li\_r, x));

x = 3.2;

System.out.println("x = " + x + ", real value = " + my\_sqr(x) +

" interpolation = " + interpolate(li\_r, x));

x = 4.5;

System.out.println("x = " + x + ", real value = " + my\_sqr(x) +

" interpolation = " + interpolate(li\_r, x));

x = 5.5;

System.out.println("x = " + x + ", real value = " + my\_sqr(x) +

" interpolation = " + interpolate(li\_r, x));

x = 5.2;

System.out.println("x = " + x + ", real value = " + my\_sqr(x) +

" interpolation = " + interpolate(li\_r, x));

x = 6.3;

System.out.println("x = " + x + ", real value = " + my\_sqr(x) +

" interpolation = " + interpolate(li\_r, x));

x = 6.5;

System.out.println("x = " + x + ", real value = " + my\_sqr(x) +

" interpolation = " + interpolate(li\_r, x));

x = 3.9;

System.out.println("x = " + x + ", real value = " + my\_sqr(x) +

" interpolation = " + interpolate(li\_r, x));

x = 3.1;

System.out.println("x = " + x + ", real value = " + my\_sqr(x) +

" interpolation = " + interpolate(li\_r, x));

} /\* main \*/

} // li

פלט ריצה:

x = 1.5, real value = 2.25 interpolation = 2.5

x = 2.5, real value = 6.25 interpolation = 6.5

x = 3.2, real value = 10.240000000000002 interpolation = 10.400000000000002

x = 4.5, real value = 20.25 interpolation = 20.5

x = 5.5, real value = 30.25 interpolation = 30.5

x = 5.2, real value = 27.040000000000003 interpolation = 27.200000000000003

x = 6.3, real value = 39.69 interpolation = 39.9

x = 6.5, real value = 42.25 interpolation = 42.5

x = 3.9, real value = 15.209999999999999 interpolation = 15.299999999999999

x = 3.1, real value = 9.610000000000001 interpolation = 9.700000000000001

התוכנית הבאה מבצעת אינטרפולציה לגרנז על נקודות של הפונקציה

f(x) = x2

ומשווה תוצאות לערך האמיתי. מכיוון ש f(x) הוא פולינום, האינטרפולציה היא **מדויקת**:

/\* lagrange1.java - implement linear interpolation \*/

class Point

{

public double x;

public double fx;

}//Point

class Li

{

public int n; /\* no\_of\_Points \*/

Point [] point\_arr;

double interpolate(double x)

{

int i, j;

double t1, t2;

t1 = 0.0;

for(i=0; i <=n; i++)

{

t2 = point\_arr[i].fx;

for(j=0; j <=n; j++)

if(i != j)

{

t2 = t2\*(x - point\_arr[j].x);

t2 = t2/(point\_arr[i].x - point\_arr[j].x);

} /\* if \*/

t1 = t1 + t2;

} /\* for \*/

return t1;

} /\* interpolate \*/

} // Li

public class lagrange1

{

static double my\_sqr( double x)

{

return x\*x;

} /\* my\_sqr \*/

public static void main(String args[])

{

Li li\_v = new Li();

double x;

int i;

li\_v.n = 7;

li\_v.point\_arr = new Point[8];

for(i=0; i< 8; i++)

li\_v.point\_arr[i] = new Point();

li\_v.point\_arr[0].x = 0.0;

li\_v.point\_arr[0].fx = 0.0;

li\_v.point\_arr[1].x = 1.0;

li\_v.point\_arr[1].fx = 1.0;

li\_v.point\_arr[2].x = 2.0;

li\_v.point\_arr[2].fx = 4.0;

li\_v.point\_arr[3].x = 3.0;

li\_v.point\_arr[3].fx = 9.0;

li\_v.point\_arr[4].x = 4.0;

li\_v.point\_arr[4].fx = 16.0;

li\_v.point\_arr[5].x = 5.0;

li\_v.point\_arr[5].fx = 25.0;

li\_v.point\_arr[6].x = 6.0;

li\_v.point\_arr[6].fx = 36.0;

li\_v.point\_arr[7].x = 7.0;

li\_v.point\_arr[7].fx = 49.0;

x = 1.5;

System.out.println("x = " + x + ", real value = " +

my\_sqr(x) + ", interpolation = " +

li\_v.interpolate(x));

x = 2.5;

System.out.println("x = " + x + ", real value = " +

my\_sqr(x) + ", interpolation = " +

li\_v.interpolate(x));

x = 3.5;

System.out.println("x = " + x + ", real value = " +

my\_sqr(x) + ", interpolation = " +

li\_v.interpolate(x));

x = 4.5;

System.out.println("x = " + x + ", real value = " +

my\_sqr(x) + ", interpolation = " +

li\_v.interpolate(x));

x = 5.5;

System.out.println("x = " + x + ", real value = " +

my\_sqr(x) + ", interpolation = " +

li\_v.interpolate(x));

x = 5.5;

System.out.println("x = " + x + ", real value = " +

my\_sqr(x) + ", interpolation = " +

li\_v.interpolate(x));

x = 6.5;

System.out.println("x = " + x + ", real value = " +

my\_sqr(x) + ", interpolation = " +

li\_v.interpolate(x));

x = 6.5;

System.out.println("x = " + x + ", real value = " +

my\_sqr(x) + ", interpolation = " +

li\_v.interpolate(x));

x = 3.9;

System.out.println("x = " + x + ", real value = " +

my\_sqr(x) + ", interpolation = " +

li\_v.interpolate(x));

x = 3.1;

System.out.println("x = " + x + ", real value = " +

my\_sqr(x) + ", interpolation = " +

li\_v.interpolate(x));

} /\* main \*/

} // lagrange1

פלט ריצה:

x = 1.5, real value = 2.25, interpolation = 2.25

x = 2.5, real value = 6.25, interpolation = 6.25

x = 3.5, real value = 12.25, interpolation = 12.25

x = 4.5, real value = 20.25, interpolation = 20.25

x = 5.5, real value = 30.25, interpolation = 30.25

x = 5.5, real value = 30.25, interpolation = 30.25

x = 6.5, real value = 42.25, interpolation = 42.25

x = 6.5, real value = 42.25, interpolation = 42.25

x = 3.9, real value = 15.209999999999999, interpolation = 15.209999999999996

x = 3.1, real value = 9.610000000000001, interpolation = 9.610000000000001