

18.337 Midterm Project

October 31, 2016

1 Automatic differentiation for non-differentiable functions

How can we automatically generate derivative-like information for non-differentiable functions in a manner analogous to automatic differentiation for smooth functions?

ForwardDiff.jl package works nicely for differentiable functions:

```
In [1]: using ForwardDiff
```

```
In [2]: x = 1.0;
        smoothFun(x) = x^2
        g1 = x -> ForwardDiff.derivative(smoothFun, x);
        g1(x)
```

```
Out [2]: 2.0
```

But what about for a nondifferentiable function?

```
In [3]: maxFun(x) = max(x, x^2);
        g2 = x -> ForwardDiff.derivative(maxFun, x);
        g2(x)
```

```
Out [3]: 2.0
```

```
In [4]: maxFun2(x) = max(x^2, x);
        g3 = x -> ForwardDiff.derivative(maxFun2, x);
        g3(x)
```

```
Out [4]: 1.0
```

1.1 Automatic computation of lexicographic directional (LD) derivatives

We can solve this problem by using “lexicographic directional derivatives” instead of classical directional derivatives and defining the “rules” for elemental nonsmooth functions.

In brief, the LD-derivative takes as an argument an n dimensional vector and a nonsingular $n \times p$ direction matrix:

Classic directional derivative: $f'(x, d_0)$, with $x, d_0 \in \mathbb{R}^n$

Lexicographic directional derivative: $f'(x, M)$, with $M = [d_0 \ d_1 \dots \ d_p] \in \mathbb{R}^{n \times p}$, $\det(M) \neq 0$.

LD-derivative calculations consider a sequence of directions to resolve a generalized derivative at points of nonsmoothness.

```

In [5]: type ldouble{T<:Real,U<:Integer}
        value::T
        dot::Vector{T}
        depth::U
        ldouble(x,dot,depth) = length(dot) == depth ? new(x,dot,depth) : error
end

In [6]: ## Constructors
        ldouble() = ldouble(0.0,Vector{Float64}(0),0);
        ldouble{U<:Integer}(depth::U) = ldouble(0.0, zeros(Float64,depth),depth);
        ldouble{T<:Real,U<:Integer}(x::T,depth::U) = ldouble(x,zeros(T,depth),depth);
        ldouble{T<:Real,U<:Integer}(x::T,dot::Vector{T},depth::U) = ldouble{T,U}(x,

```

The LD-derivative is a generalization of the directional derivative that obeys a sharp chain rule.

This means that all smooth functions can be differentiated exactly as in the case of classic AD.

```

In [7]: ## Operator overloads

        ## Display
        import Base.show
        function show(io::IO, zA::ldouble)
            print(io, zA.value, " ", zA.dot);
        end

        ## Negation
        import Base.-
        function -(zA::ldouble)
            zOut = ldouble(zA.depth);
            zOut.value = (-zA.value);
            zOut.dot = -zA.dot;
            return zOut;
        end

        ## Addition
        import Base.+
        function +(zA::ldouble,x::Real)
            zOut = ldouble(zA.depth);
            zOut.value = zA.value + x;
            zOut.dot = zA.dot;
            return zOut;
        end

        import Base.+
        function +(x::Real,zA::ldouble)
            return zA+x;
        end

```

```

import Base.+
function +(zA::ldouble, zB::ldouble)
    if (zA.depth == 0 && zB.depth > 0)
        return zA.value + zB;
    end
    if (zA.depth > 0 && zB.depth == 0)
        return zA + zB.value;
    end

    assert(zA.depth == zB.depth);
    zOut = ldouble(zA.depth);
    zOut.value = zA.value+zB.value;
    zOut.dot = zA.dot + zB.dot;

    return zOut;
end

```

Subtraction

```

import Base.-
function -(zA::ldouble, x::Real)
    zOut = ldouble(zA.depth);
    zOut.value = zA.value - x;
    zOut.dot = zA.dot;
    return zOut;
end

```

```

import Base.-
function -(x::Real, zA::ldouble)
    return -(zA-x);
end

```

```

import Base.-
function -(zA::ldouble, zB::ldouble)
    if (zA.depth == 0 && zB.depth > 0)
        return zA.value - zB;
    end
    if (zA.depth > 0 && zB.depth == 0)
        return zA - zB.value;
    end

    assert(zA.depth == zB.depth);
    zOut = ldouble(zA.depth);
    zOut.value = zA.value - zB.value;
    zOut.dot = zA.dot - zB.dot;

    return zOut;
end

```

```

## Multiply

import Base.*
function *(zA::ldouble, x::Real)
    zOut = ldouble(zA.depth);
    zOut.value = zA.value * x;
    zOut.dot = x*zA.dot;
    return zOut;
end

import Base.*
function *(x::Real, zA::ldouble)
    return zA*x;
end

import Base.*
function *(zA::ldouble, zB::ldouble)
    if (zA.depth == 0 && zB.depth > 0)
        return zA.value * zB;
    end
    if (zA.depth > 0 && zB.depth == 0)
        return zA * zB.value;
    end

    assert(zA.depth == zB.depth);
    zOut = ldouble(zA.depth);
    zOut.value = zA.value * zB.value;
    for i = 1:zA.depth
        zOut.dot[i] = zA.dot[i]*zB.value + zA.value*zB.dot[i];
    end

    return zOut;
end

## Divide

import Base./
function /(zA::ldouble, x::Real)
    assert(x!=0.0);
    zOut = ldouble(zA.depth);
    zOut.value = zA.value / x;
    zOut.dot = zA.dot/x;
    return zOut;
end

import Base./
function /(x::Real, zA::ldouble)

```

```

    if zA.value != 0.0
        zOut = ldouble(zA.depth);
        zOut.value = x/zA.value;
        for i = 1:zA.depth
            zOut.dot[i] = x*(-zA.dot[i])/(zA.value*zA.value);
        end
    else
        error("Attempt to divide by zero!");
    end

    return zOut;
end

import Base./
function /(zA::ldouble, zB::ldouble)
    return zA * (1.0/zB);
end

## Exp
import Base.exp
function exp(zA::ldouble)
    zOut = ldouble(zA.depth);
    zOut.value = exp(zA.value);
    for i = 1:zA.depth
        zOut.dot[i] = zA.dot[i]*zOut.value;
    end
    return zOut;
end
end

```

Out [7]: exp (generic function with 14 methods)

The nonsmooth elemental functions are more involved.

For example, the absolute value function generalized derivatives are given by:

```

Set  $s_1 \leftarrow \text{sign}(x)$ 
for  $k = 1 : p$ 
if  $s_1 = 0$ 
 $s_1 \leftarrow \text{sign}(m_{(k)})$ 
$ end $
Set  $\dot{v}_{(k)} \leftarrow s_1 m_{(k)}$ 
end

```

Code below implements: $\text{abs}(\cdot)$, $\text{max}(\cdot, \cdot)$, $\text{min}(\cdot, \cdot)$, $\text{mid}(\cdot, \cdot, \cdot)$, $\|(\cdot, \cdot)\|_2$ for relevant combinations of ldouble and real number objects.

```

In [8]: ## Nonsmooth functions
import Base.abs
function abs(zA::ldouble)
    zOut = ldouble(zA.depth);
    zOut.value = abs(zA.value);

```

```

s = (0.0 < zA.value) - (zA.value < 0.0);
for i = 1:zA.depth
    if (s==0)
        s = (0.0 < zA.dot[i]) - (zA.dot[i] < 0.0);
    end
    zOut.dot[i] = s*zA.dot[i];
end
return zOut;
end

import Base.max
function max(zA::ldouble, x::Real)
    zOut = ldouble(zA.depth);
    zOut.value = max(zA.value, x);
    s = (x < zA.value) - (zA.value < x);
    for i = 1:zA.depth
        if (s==0)
            s = (0.0 < zA.dot[i]) - (zA.dot[i] < 0.0);
        end
        if (s >= 0)
            zOut.dot[i] = zA.dot[i];
        else
            zOut.dot[i] = 0.0;
        end
    end
    return zOut;
end

import Base.max
function max(x::Real, zA::ldouble)
    return max(zA, x);
end

import Base.max
function max(zA::ldouble, zB::ldouble)
    if (zA.depth == 0 && zB.depth > 0)
        return max(zA.value, zB);
    end
    if (zA.depth > 0 && zB.depth == 0)
        return max(zA, zB.value);
    end
    assert (zA.depth == zB.depth);
    zOut = ldouble(zA.depth);
    zOut.value = max(zA.value, zB.value);
    s = (zB.value < zA.value) - (zA.value < zB.value);
    for i = 1:zA.depth
        if (s==0)
            s = (zB.dot[i] < zA.dot[i]) - (zA.dot[i] < zB.dot[i]);

```

```

        end
        if (s >= 0)
            zOut.dot[i] = zA.dot[i];
        else
            zOut.dot[i] = zB.dot[i];
        end
    end
    return zOut;
end

import Base.min
function min(zA::ldouble, x::Real)
    zOut = ldouble(zA.depth);
    zOut.value = min(zA.value, x);
    s = (x < zA.value) - (zA.value < x);
    for i = 1:zA.depth
        if (s==0)
            s = (0.0 < zA.dot[i]) - (zA.dot[i] < 0.0);
        end
        if (s <= 0)
            zOut.dot[i] = zA.dot[i];
        else
            zOut.dot[i] = 0.0;
        end
    end
    return zOut;
end

import Base.min
function min(x::Real, zA::ldouble)
    return min(zA, x);
end

import Base.min
function min(zA::ldouble, zB::ldouble)
    if (zA.depth == 0 && zB.depth > 0)
        return min(zA.value, zB);
    end
    if (zA.depth > 0 && zB.depth == 0)
        return min(zA, zB.value);
    end
    assert(zA.depth == zB.depth);
    zOut = ldouble(zA.depth);
    zOut.value = min(zA.value, zB.value);
    s = (zB.value < zA.value) - (zA.value < zB.value);
    for i = 1:zA.depth
        if (s==0)
            s = (zB.dot[i] < zA.dot[i]) - (zA.dot[i] < zB.dot[i]);

```

```

        end
        if (s <= 0)
            zOut.dot[i] = zA.dot[i];
        else
            zOut.dot[i] = zB.dot[i];
        end
    end
    return zOut;
end

function mid{T,U,V}(zA::T, zB::U, zC::V)
    return max(min(zA,zB),min(max(zA,zB),zC));
end

function twonorm(zA::ldouble, x::Real)
    zOut = ldouble(zA.depth);
    zOut.value = sqrt(zA.value*zA.value + x*x);
    if zOut.value != 0.0
        zAunitV = zA.value/zOut.value;
        for i = 1:zA.depth
            zOut.dot[i] = zAunitV*zA.dot[i];
        end
    else
        mjAunitV = 0.0;
        for i = 1:zA.depth
            if mjAunitV == 0.0
                mjAunitV = (0.0 < zA.dot[i]) - (zA.dot[i] < 0.0);
            end
            if mjAunitV != 0.0
                zOut.dot[i] = mjAunitV*zA.dot[i];
            else
                zOut.dot[i] = 0.0;
            end
        end
    end
    return zOut;
end

function twonorm(x::Real, zA::ldouble)
    return twonorm(zA,x);
end

function twonorm(zA::ldouble, zB::ldouble)
    if (zA.depth == 0 && zB.depth > 0)
        return twonorm(zA.value,zB);
    end
    if (zA.depth > 0 && zB.depth == 0)
        return twonorm(zA,zB.value);
    end
end

```



```

end
assert(zA.depth == zB.depth);
zOut = ldouble(zA.depth);
zOut.value = sqrt(zA.value*zA.value + zB.value*zB.value);
if zOut.value != 0.0
    zAunitV = zA.value/zOut.value;
    zBunitV = zB.vlaue/zOut.value;
    for i = 1:zA.depth
        zOut.dot[i] = zAunitV*zA.dot[i]+zBunitV*zB.dot[i];
    end
else
    mjNorm = 0.0; mjAunitV = 0.0; mjBunitV = 0.0;
    for i = 1:zA.depth
        if mjNorm == 0.0
            mjNorm = sqrt(zA.dot[i]*zA.dot[i]+zB.dot[i]*zB.dot[i]);
            if mjNorm > 0.0
                mjAunitV = zA.dot[i]/mjNorm;
                mjBunitV = zB.dot[i]/mjNorm;
            end
        end
        if mjNorm != 0.0
            zOut.dot[i] = mjAunitV*zA.dot[i]+mjBunitV*zB.dot[i];
        else
            zOut.dot[i] = 0.0;
        end
    end
end
return zOut;
end

```

Out[8]: twonorm (generic function with 3 methods)

1.2 Arithmetic and nonsmooth function tests

In [9]: zA = ldouble(1.7, [-1.0, -1.0, -1.0], 3)

Out[9]: 1.7 [-1.0,-1.0,-1.0]

In [10]: zB = ldouble(5.0, [-3.0, 2.0, 3.0], 3)

Out[10]: 5.0 [-3.0,2.0,3.0]

In [11]: x = 2.3;

In [12]: -zA

Out[12]: -1.7 [1.0,1.0,1.0]

In [13]: zA+zB

```
Out [13]: 6.7 [-4.0,1.0,2.0]
In [14]: zA+x
Out [14]: 4.0 [-1.0,-1.0,-1.0]
In [15]: x+zB
Out [15]: 7.3 [-3.0,2.0,3.0]
In [16]: zA*zB
Out [16]: 8.5 [-10.1,-1.6,0.1]
In [17]: zA*x
Out [17]: 3.9099999999999997 [-2.3,-2.3,-2.3]
In [18]: x*zB
Out [18]: 11.5 [-6.9,4.6,6.9]
In [19]: zA-zB
Out [19]: -3.3 [2.0,-3.0,-4.0]
In [20]: zA-x
Out [20]: -0.5999999999999999 [-1.0,-1.0,-1.0]
In [21]: x-zB
Out [21]: -2.7 [3.0,-2.0,-3.0]
In [22]: zA/zB
Out [22]: 0.34 [0.004,-0.336,-0.404]
In [23]: zA/x
Out [23]: 0.7391304347826088 [-0.434783,-0.434783,-0.434783]
In [24]: x/zB
Out [24]: 0.45999999999999996 [0.276,-0.184,-0.276]
In [25]: zC = ldouble(0.0,[0.0,-2.0,3.0], 3)
Out [25]: 0.0 [0.0,-2.0,3.0]
In [26]: zD = ldouble(0.0,[0.0,-2.0,4.0],3)
Out [26]: 0.0 [0.0,-2.0,4.0]
```

```
In [27]: y = 0.0;
In [28]: abs(zC)
Out [28]: 0.0 [0.0, 2.0, -3.0]
In [29]: max(zC, zD)
Out [29]: 0.0 [0.0, -2.0, 4.0]
In [30]: max(zC, y)
Out [30]: 0.0 [0.0, 0.0, 0.0]
In [31]: max(y, zD)
Out [31]: 0.0 [0.0, 0.0, 0.0]
In [32]: min(zC, zD)
Out [32]: 0.0 [0.0, -2.0, 3.0]
In [33]: min(zC, y)
Out [33]: 0.0 [0.0, -2.0, 3.0]
In [34]: min(y, zD)
Out [34]: 0.0 [0.0, -2.0, 4.0]
In [35]: mid(zC, zD, y)
Out [35]: 0.0 [0.0, -2.0, 4.0]
In [36]: h(x, y, z) = x+y+z-max(max(x, y), z)-min(min(x, y), z);
In [37]: h(zC, zD, y)
Out [37]: 0.0 [0.0, -2.0, 4.0]
In [38]: twonorm(zC, zD)
Out [38]: 0.0 [0.0, 2.82843, -4.94975]
In [39]: twonorm(zC, y)
Out [39]: 0.0 [0.0, 2.0, -3.0]
In [40]: twonorm(y, zD)
Out [40]: 0.0 [0.0, 2.0, -4.0]
```

1.3 Solving nonsmooth equations with LD-derivatives

Suppose we want to find the zeros of the following function:

$$\mathbf{f} : \mathbb{R}^2 \times \mathbb{R}^2 \rightarrow \mathbb{R}^2 : (\mathbf{x}, \mathbf{p}) \mapsto \begin{bmatrix} p_1 x_2 + \text{abs}(x_1 + x_2) \max(x_1, x_2) \\ x_2 + p_2 x_1 \min(\max(x_1, x_2), x_1) \end{bmatrix},$$

with parameter values $\mathbf{p} = [2.0, 1.0]$.

```
In [41]: function f{T,U}(x::Vector{T}, p::Vector{U}, y::Vector{T})
```

```
    y[1] = p[1]*x[2] + max(x[1], x[2])*abs(x[1]+x[2]);
    y[2] = x[2]+p[2]*x[1]*min(max(x[1], x[2]), x[1]);
```

```
end
```

```
Out[41]: f (generic function with 1 method)
```

The simplest way to do this is with the semismooth Newton method. This is essentially identical to the classical Newton method, except the Newton step is defined as:

$$\mathbf{G}(\mathbf{x}^k)(\mathbf{x}^{k+1} - \mathbf{x}^k) = -\mathbf{f}(\mathbf{x}^k), \quad (1)$$

where $\mathbf{G}(\mathbf{x}^k)$ is an element of a generalized derivative of \mathbf{f} at \mathbf{x}^k .

We can generate a generalized derivative with desirable convergence properties by setting:

$$\mathbf{G}(\mathbf{x}^k) := \mathbf{f}'(\mathbf{x}^k; \mathbf{I}), \quad (2)$$

where \mathbf{I} is the $n \times n$ identity matrix.

```
In [42]: function semismoothNewton{T<:Real}(x::Vector{T}, p::Vector{T}, usr_fun::Fu
```

```
    ## Preallocation
    nVar = length(x);
    y = Vector{T}(nVar);
    ldX = Vector{ldouble}(nVar);
    ldY = Vector{ldouble}(nVar);
    genDeriv = Matrix{Real}(nVar, nVar);
    maxNorm = 2.0*eTol;
    nIter = 0;
    convdata = Array{Real}(0, 2);
```

```
    ## Main solver loop
    while (maxNorm >= eTol && nIter < maxIt)
        nIter += 1;
```

```
        ## Initialize Ldoubles with direction matrix as the identity matrix
        for i=1:nVar
```

```

        ldX[i] = ldouble(nVar);
        ldX[i].value = x[i];
        for j = 1:nVar
            ldX[i].dot[j] = 0.0;
        end
        ldX[i].dot[i] = 1.0;
    end

    ## Call user defined function
    usr_fun(ldX,p,ldY);

    ## Unpack residual, generalized derivative element and calculate e
    maxNorm = 0.0;
    for i=1:nVar
        y[i] = ldY[i].value;
        maxNorm = max(maxNorm,abs(y[i]));
        for j = 1:nVar
            genDeriv[i,j] = ldY[i].dot[j];
        end
    end

    ## Print and store iteration statistics
    println("Iter ", nIter, ": ||f(x)|| = ", maxNorm);
    convdata = [convdata; nIter maxNorm];

    ## Take Newton step if needed
    if (maxNorm >= eTol)
        d = genDeriv\y;
        x -= d;
    end

end

if (maxNorm < eTol && nIter <= maxIt)
    println("Solution: ", x, ", Residual value: ", y)
    return true, convdata;
end

println("Solution not found!")
return false, convdata;
end

```

Out[42]: semismoothNewton (generic function with 1 method)

```
In [61]: x = [3.0,3.0]; p = [2.0,1.0];
        status, SSconvdata = semismoothNewton(x,p,f,50,1.0e-9);
```

Iter 1: ||f(x)|| = 24.0

Iter 2: ||f(x)|| = 5.877551020408163

```

Iter 3: ||f(x)|| = 1.3541877551020405
Iter 4: ||f(x)|| = 0.2472544205707181
Iter 5: ||f(x)|| = 0.020453123731630107
Iter 6: ||f(x)|| = 0.00020094522028321754
Iter 7: ||f(x)|| = 2.018138007374142e-8
Iter 8: ||f(x)|| = 2.0364404829940559e-16
Solution: [-3.54198e-16,1.01822e-16], Residual value: [2.03644e-16,1.01822e-16]

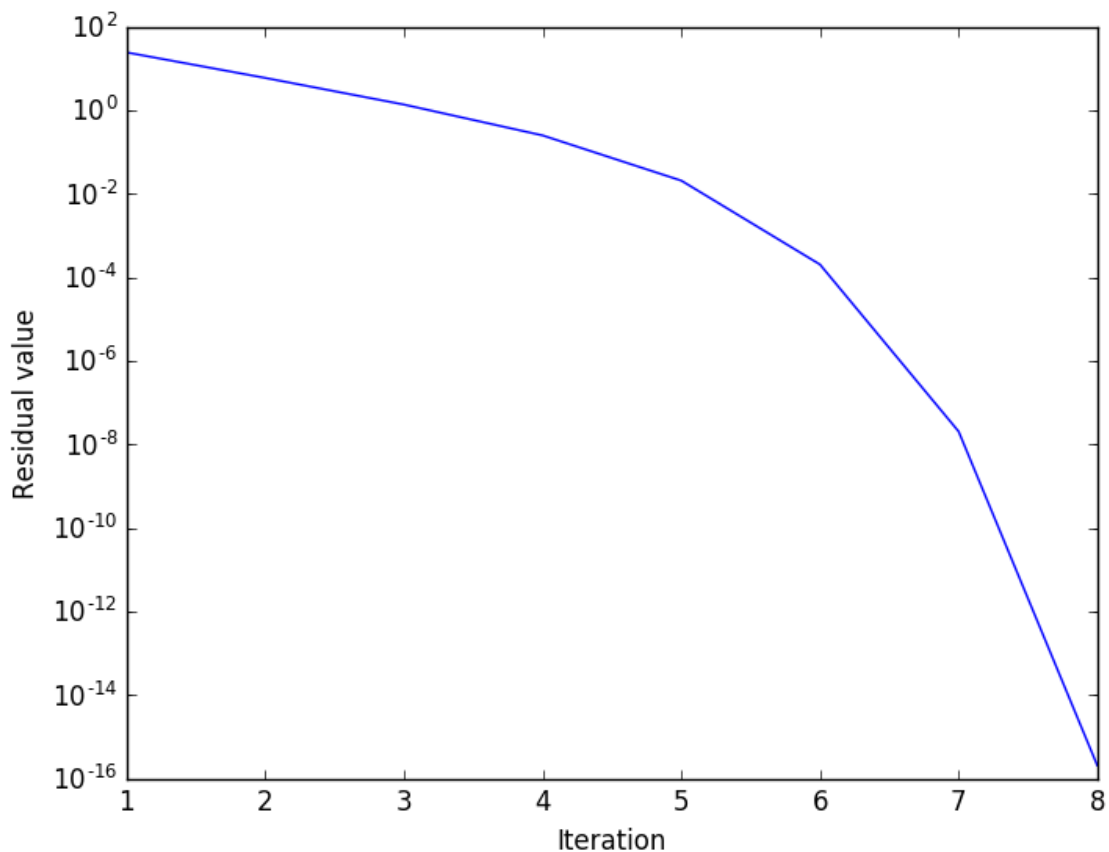
```

For particular types of generalized derivatives, this method will converge quadratically in a local neighborhood of the solution. For the types of functions above (piecewise-differentiable functions), LD-derivatives evaluated with the identity direction matrix satisfy the necessary properties.

```

In [44]: using PyPlot;
          semilogy(SSconvddata[:,1],SSconvddata[:,2])
          xlabel("Iteration");
          ylabel("Residual value");
          xticks(SSconvddata[:,1]);

```



```

In [62]: x2 = [4.0, -5.0]; p = [2.0, 1.0];
          semismoothNewton(x2,p,f,50,1.0e-9);

```

```

Iter 1: ||f(x)|| = 11.0
Iter 2: ||f(x)|| = 2.9349112426035493
Iter 3: ||f(x)|| = 1.1476936239800857
Iter 4: ||f(x)|| = 0.06393928408497018
Iter 5: ||f(x)|| = 0.00024900855904874675
Iter 6: ||f(x)|| = 3.775141976802843e-9
Iter 7: ||f(x)|| = 3.552713678800501e-15
Solution: [3.0,-9.0], Residual value: [-3.55271e-15,0.0]

```

1.4 Was all this LD-derivative calculation actually necessary?

Could we have used a less convoluted definition of the generalized derivative?

In the previous example, assembling a derivative by concatenating directional derivatives in the coordinate directions may have worked (this was the only way before LD-derivatives).

However, this example shows that this does NOT work for all nonsmooth functions.

$$g: \mathbb{R}^2 \rightarrow \mathbb{R}^2: \mathbf{x} \mapsto \begin{bmatrix} \min(2x_1 - 2x_2, x_1)/3 \\ \max(2x_2 - 2x_1, x_2)/3 \end{bmatrix}$$

```
In [63]: function g{T,U}(x::Vector{T}, p::Vector{U}, y::Vector{T})
```

```

    y[1] = 1/3*min(2*x[1] - 2*x[2], x[1]);
    y[2] = 1/3*max(2*x[2] - 2*x[1], x[2]);

    return;
end

```

```
WARNING: Method definition g(Array
```

```
Out[63]: g (generic function with 1 method)
```

```
{#T<:Any, 1}, Array{#U<:Any, 1}, Array{#T<:Any, 1}) in module Main at In[46]:3 over
```

```
In [64]: x3 = [2.0,1.0];
          semismoothNewton(x3,p,g,50,1.0e-9);
```

```

Iter 1: ||f(x)|| = 0.6666666666666666
Iter 2: ||f(x)|| = 0.0
Solution: Real[0.0,0.0], Residual value: [0.0,0.0]

```

So the semismooth Newton method solves this in one iteration. Now, say we assemble the following generalized derviative:

$$\hat{\mathbf{J}}g(\mathbf{x}) := [g'(\mathbf{x}^k; \mathbf{e}_1) \quad g'(\mathbf{x}; \mathbf{e}_2)] \neq g'(\mathbf{x}^k; \mathbf{I}) \quad (3)$$

```
In [48]: function dumbNewton{T<:Real}(x::Vector{T}, p::Vector{T}, usr_fun::Function
```

```
    ## Preallocation
    nVar = length(x);
    y = Vector{T}(nVar);
    ldX = Vector{ldouble}(nVar);
    ldY = Vector{ldouble}(nVar);
    genDeriv = Matrix{Real}(nVar,nVar);
    maxNorm = 2.0*eTol;
    nIter = 0;

    ## Begin main solver loop
    while (maxNorm >= eTol && nIter < maxIt)
        nIter += 1;

        ## Set up depth-one derivatives
        for i=1:nVar
            ldX[i] = ldouble(1);
            ldX[i].value = x[i];
        end

        ## Evalaute the function nVar times with each coordinate vector and
        for k = 1:nVar
            for i = 1:nVar
                ldX[i].dot[1] = 0.0
                if (k == i)
                    ldX[k].dot[1] = 1.0;
                end
            end

            usr_fun(ldX,p,ldY);

            for i = 1:nVar
                genDeriv[i,k] = ldY[i].dot[1];
            end
        end

        maxNorm = 0.0;
        for i=1:nVar
            y[i] = ldY[i].value;
            maxNorm = max(maxNorm,abs(y[i]));
        end

        println("Iter ", nIter, ": ||f(x)|| = ", maxNorm);

        ## Take Newton step if needed
        if (maxNorm >= eTol)
            d = genDeriv\y;
```



```

        x -= d;
    end

end

if (maxNorm < eTol && nIter <= maxIt)
    println("Solution: ", x, ", Residual value: ", y)
    return true;
end

println("Solution not found!")
return false;
end
end

```

Out[48]: dumbNewton (generic function with 1 method)

```
In [65]: x3 = [2.0,1.0];
         dumbNewton(x3,p,g,50,1.0e-9);
```

```
Iter 1: ||f(x)|| = 0.6666666666666666
Iter 2: ||f(x)|| = 1.3333333333333333
```

```
LoadError: Base.LinAlg.SingularException(2)
while loading In[65], in expression starting on line 2
```

```

in A_ldiv_B! at .\linalg\lu.jl:176 [inlined]
in \ (::Base.LinAlg.LU{Float64,Array{Float64,2}}, ::Array{Float64,1}) at .\
in \ (::Array{Real,2}, ::Array{Float64,1}) at .\linalg\generic.jl:361
in dumbNewton(::Array{Float64,1}, ::Array{Float64,1}, ::#g, ::Int64, ::Flo

```

Here, the Newton step has taken us to a point with a singular pseudo-Jacobian and the method fails.

1.5 A more robust Newton-type method

Suppose we want to solve the optimization problem:

$$\min_x (x_1 + x_2)x_4 + 0.5(x_2 + x_3)^2 \quad (4)$$

$$\text{s.t } x_1 \leq 0 \quad (5)$$

$$x_1 \geq 0 \quad (6)$$

$$x_2 \geq 1 \quad (7)$$

$$x_4 \geq 0 \quad (8)$$

$$x_1 + x_2 + x_3 \geq 0. \quad (9)$$

We'll do this by setting up and solving the associated nonsmooth system of equations defining its KKT points.

```
In [50]: function KKTsys{T,U}(x::Vector{T}, p::Vector{U}, y::Vector{T})
```

```

    z = x[1:4]; u = x[5:9]; v = x[10:14];

    y[1] = z[4] + u[1] - u[2] - u[5];
    y[2] = x[4] + x[2] + x[3] - u[3] - u[5];
    y[3] = x[2] + x[3] - u[5];
    y[4] = x[1] + x[2] - u[4];
    y[5] = x[1] + v[1];
    y[6] = -x[1] + v[2];
    y[7] = 1 - x[2] + v[3];
    y[8] = -x[4] + v[4];
    y[9] = -x[1] - x[2] - x[3] + v[5];
    for i = 1:5
        y[9+i] = min(u[i],v[i]);
    end

end
```

```
Out[50]: KKTsys (generic function with 1 method)
```

```
In [51]: x0 = [1.0, 4.0, -2.0, 1.0, 3.0, 3.0, 1.0, 4.0, 1.0, 0.0, 1.0, 3.0, 1.0, 3.0];
          semismoothNewton(x0, p, KKTsys, 50, 1.0e-9);
```

```
Iter 1: ||f(x)|| = 1.0
```

```
LoadError: Base.LinAlg.SingularException(6)
while loading In[51], in expression starting on line 2
```

```
in A_ldiv_B! at .\linalg\lu.jl:176 [inlined]
```

```
in \ (::Base.LinAlg.LU{Float64,Array{Float64,2}}, ::Array{Float64,1}) at .\
```

```
in \ (::Array{Real,2}, ::Array{Float64,1}) at .\linalg\generic.jl:361
```

```
in semismoothNewton (::Array{Float64,1}, ::Array{Float64,1}, ::#KKTsys, ::1
```

Oh no! The semismooth Newton method failed because it encountered a singular generalized derivative, even when using LD-derivatives.

Luckily, there is another method we can use. It is called the LP Newton method, wherein the linear solve step of the Newton method is replaced a linear program solve:

$$\min_{\gamma, \mathbf{x}} \gamma \tag{10}$$

$$\text{s.t. } \|\mathbf{f}(\mathbf{x}^k) + \mathbf{G}(\mathbf{x}^k)(\mathbf{x} - \mathbf{x}^k)\|_{\infty} \leq \gamma \min \left(\|\mathbf{f}(\mathbf{x}^k)\|_{\infty}, \|\mathbf{f}(\mathbf{x}^k)\|_{\infty}^2 \right), \tag{11}$$

$$\|\mathbf{x} - \mathbf{x}^k\|_{\infty} \leq \gamma \|\mathbf{f}(\mathbf{x}^k)\|_{\infty}, \tag{12}$$

$$\mathbf{x} \in X, \tag{13}$$

where γ is a dummy variable used to drive convergence to the solution and X is a set of known bounds on the solution. The \mathbf{x} part of the solution is then used as the next iterate for the algorithm.

```
In [52]: using JuMP
```

```
In [53]: function lpNewton{T<:Real}(x::Vector{T}, p::Vector{T}, usr_fun::Function,
```

```

nVar = length(x);
y = Vector{T}(nVar);
ldX = Vector{ldouble}(nVar);
ldY = Vector{ldouble}(nVar);
genDeriv = Matrix{Real}(nVar,nVar);
maxNorm = 2.0*eTol;
nIter = 0;
convdata = Array{Real}(0,2);

while (maxNorm >= eTol && nIter < maxIt)
    nIter += 1;
    for i=1:nVar
        ldX[i] = ldouble(nVar);
        ldX[i].value = x[i];
        for j = 1:nVar
            ldX[i].dot[j] = 0.0;
        end
        ldX[i].dot[i] = 1.0;
    end

    usr_fun(ldX,p,ldY);

    maxNorm = 0.0;

```

```

    for i=1:nVar
        y[i] = ldY[i].value;
        maxNorm = max(maxNorm,abs(y[i]));
        for j = 1:nVar
            genDeriv[i,j] = ldY[i].dot[j];
        end
    end

println("Iter ", nIter, ": ||f(x)|| = ", maxNorm);

if (maxNorm >= eTol)
    m = Model();

    @variable(m, γ >= 0);
    @variable(m, xlow[i] <= z[i=1:nVar] <= xupp[i]);

    @objective(m, Min, γ);

    @constraint(m, y + genDeriv*(z-x) .<= γ*min(maxNorm,maxNorm*maxNorm));
    @constraint(m, -(y + genDeriv*(z-x)) .<= γ*min(maxNorm,maxNorm*maxNorm));
    @constraint(m, z-x .<= γ*maxNorm);
    @constraint(m, -(z-x) .<= γ*maxNorm);

    status = solve(m);
    for i = 1:nVar
        x[i] = getvalue(z[i]);
    end
end
convdata = [convdata; nIter maxNorm];
end

if (maxNorm < eTol && nIter <= maxIt)
    println("Solution: ", x)
    println("Residual value: ", y)
    return true, convdata;
end

println("Solution not found!")
return false, convdata;
end

```

Out [53]: lpNewton (generic function with 1 method)

Let's double check that this works on the earlier simple function:

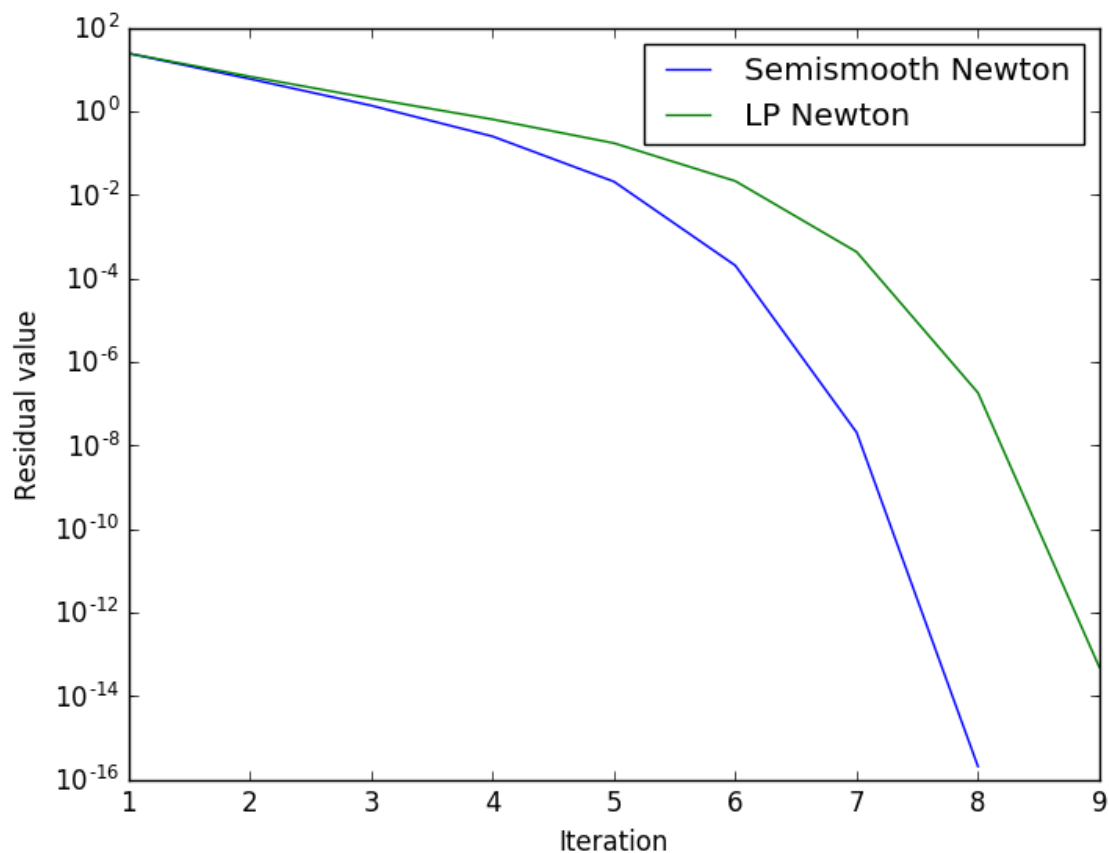
```
In [66]: x = [3.0,3.0]; xlow = [-10.0,-10.0]; xupp = [10.0,10.0];
         status,LPconvdata = lpNewton(x,p,f,50,1.0e-9,xlow,xupp);
```

Iter 1: ||f(x)|| = 24.0

Iter 2: ||f(x)|| = 6.719999999999999

```
Iter 3: ||f(x)|| = 2.0025527312060563
Iter 4: ||f(x)|| = 0.6334239619901936
Iter 5: ||f(x)|| = 0.17049700878632884
Iter 6: ||f(x)|| = 0.021093977708017634
Iter 7: ||f(x)|| = 0.0004248285284923757
Iter 8: ||f(x)|| = 1.8030693578020952e-7
Iter 9: ||f(x)|| = 4.8765863204943586e-14
Solution: [0.0,2.43829e-14]
Residual value: [4.87659e-14,2.43829e-14]
```

```
In [67]: semilogy(SSconvdata[:,1],SSconvdata[:,2])
         semilogy(LPconvdata[:,1],LPconvdata[:,2])
         xlabel("Iteration");
         ylabel("Residual value");
         xticks(LPconvdata[:,1]);
         legend(["Semismooth Newton", "LP Newton"]);
```



So we see that both methods converge, but the LP Newton method takes slightly smaller steps away from the solution.

Now let's solve the optimization problem:

```
In [68]: xlow = ones(14)*-100.0; xupp = ones(14)*100.0;
         x0 = [1.0,4.0,-2.0,1.0,3.0,3.0,1.0,4.0,1.0,0.0,1.0,3.0,1.0,3.0];
         lpNewton(x0,p,KKTsys,50,1.0e-9,xlow,xupp);

Iter 1: ||f(x)|| = 1.0
Iter 2: ||f(x)|| = 0.5
Iter 3: ||f(x)|| = 0.3571428571428573
Iter 4: ||f(x)|| = 0.22893772893772904
Iter 5: ||f(x)|| = 0.12219135831433074
Iter 6: ||f(x)|| = 0.046341180982683916
Iter 7: ||f(x)|| = 0.008717604771980358
Iter 8: ||f(x)|| = 0.0003641122321400669
Iter 9: ||f(x)|| = 6.616839520603959e-7
Iter 10: ||f(x)|| = 2.189171242070223e-12
Solution: [4.37824e-12,1.5,-1.5,2.18905e-12,0.457875,0.457875,2.18912e-12,1.5,2.18912e-12,1.5,2.18912e-12,2.18912e-12,-2.18912e-12,2.18912e-12]
Residual value: [2.1891e-12,2.18917e-12,2.18915e-12,2.18914e-12,2.18912e-12,-2.18912e-12,2.18912e-12,2.18912e-12,2.18912e-12,2.18912e-12,2.18912e-12,2.18912e-12,2.18912e-12,2.18912e-12]
```

1.6 A chemical engineering application

The process of separating a mixture into a liquid and vapor (flashing) can be modeled with non-smooth functions, where points of nonsmoothness represent transitions between phase regimes (all-vapor, two-phase equilibrium, all-liquid).

Here we look at flashing a 20-80 mol% ethanol-water mixture initially at atmospheric pressure and 350K and explore increasing the external heat duty of the process.

```
In [69]: function PQflash{T,U}(x::Vector{T}, p::Vector{U}, y::Vector{T})

         z = Vector{U}(2); Psat = Vector{T}(2); K = Vector{T}(2); xliq = Vector{T}(2)
         alpha = x[1]; ## Vapor fraction
         Temp = x[2]; ## Flash temperature, K
         Q = p[1]; ## Heat duty, W
         P = p[2]; ## Flash pressure, MPa
         z[1] = p[3]; ## Water mole fraction in feed
         z[2] = 1.0 - p[3];

         # Vapor pressure from Antoine's equation
         Psat[1] = exp(23.7836 - 3782.89/(Temp-42.85))/10^6; #K, MPa
         Psat[2] = exp(23.4776 - 3984.92/(Temp-39.72))/10^6; #K, MPa

         ## K-values from Raoult's Law
         K[1] = Psat[1]/P;
         K[2] = Psat[2]/P;

         ## Calculate vapor and liquid mole fractions
         xliq[1] = z[1]/(1.0+alpha*(K[1]-1.0));
         xliq[2] = z[2]/(1.0+alpha*(K[2]-1.0));
         yvap[1] = K[1]*xliq[1];
```

```

yvap[2] = K[2]*xliq[2];

## Enthalpy assuming constant heat capacity and Tref = 298.15K
hf = z[1]*(75.348*(350.0-298.15)) + z[2]*(111.46*(350.0-298.15));
hl = xliq[1]*(75.348*(Temp-298.15)) + xliq[2]*(111.46*(Temp-298.15));
hv = yvap[1]*(75.348*(Temp-298.15)) + yvap[2]*(111.46*(Temp-298.15));

RR = (z[1]*(K[1]-1.0))/(1.0+alpha*(K[1]-1.0)) + (z[2]*(K[2]-1.0))/(1.0+alpha*(K[2]-1.0));

y[1] = mid(alpha,alpha-1.0,-RR);
y[2] = alpha*hv + (1.0-alpha)*hl - hf - Q;
return;
end

```

WARNING: Method definition PQflash(Array

Out [69]: PQflash (generic function with 1 method)

{#T<:Any, 1}, Array{#U<:Any, 1}, Array{#T<:Any, 1}) in module Main at In[57]:3 over

```

In [70]: data = Array{Real}(0,2)
for i = 0:2:1000
    initGuess = [0.5,350]; p = [i,0.101325,0.8]; xlow = [0.0,0.0]; xupp =
    lpNewton(initGuess,p,PQflash,50,1.0e-9,xlow,xupp);
    data = [data; i initGuess[1]];
end

```

```

Iter 1: ||f(x)|| = 0.21421164031714607
Iter 2: ||f(x)|| = 0.14288779259095463
Iter 3: ||f(x)|| = 0.00024683967603778
Iter 4: ||f(x)|| = 7.412381819449365e-10
Solution: [0.0,350.0]
Residual value: [0.0,-7.41238e-10]
Iter 1: ||f(x)|| = 2.0
Iter 2: ||f(x)|| = 0.1902913415518738
Iter 3: ||f(x)|| = 0.15655544916353392
Iter 4: ||f(x)|| = 0.00029627112871821737
Iter 5: ||f(x)|| = 1.064108801074326e-9
Iter 6: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,350.024]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 4.0
Iter 2: ||f(x)|| = 0.18949548799717642
Iter 3: ||f(x)|| = 0.15585370424832945
Iter 4: ||f(x)|| = 0.0002936235623565153
Iter 5: ||f(x)|| = 1.0440999176353216e-9
Iter 6: ||f(x)|| = 2.7284841053187847e-12

```

```

Solution: [0.0,350.048]
Residual value: [0.0,2.72848e-12]
Iter 1: ||f(x)|| = 6.0
Iter 2: ||f(x)|| = 0.1886990627717185
Iter 3: ||f(x)|| = 0.15501290072006668
Iter 4: ||f(x)|| = 0.0002904669636336621
Iter 5: ||f(x)|| = 1.0222720447927713e-9
Iter 6: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,350.073]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 8.0
Iter 2: ||f(x)|| = 0.18790206922271482
Iter 3: ||f(x)|| = 0.15403505629637948
Iter 4: ||f(x)|| = 0.0002868172950911685
Iter 5: ||f(x)|| = 9.949872037395835e-10
Solution: [0.0,350.097]
Residual value: [0.0,9.94987e-10]
Iter 1: ||f(x)|| = 10.0
Iter 2: ||f(x)|| = 0.18710451070354792
Iter 3: ||f(x)|| = 0.15332928805310075
Iter 4: ||f(x)|| = 0.0002841974219336407
Iter 5: ||f(x)|| = 9.813447832129896e-10
Solution: [0.0,350.121]
Residual value: [0.0,-9.81345e-10]
Iter 1: ||f(x)|| = 12.0
Iter 2: ||f(x)|| = 0.18630639057370424
Iter 3: ||f(x)|| = 0.1523514607333709
Iter 4: ||f(x)|| = 0.00028058746556780534
Iter 5: ||f(x)|| = 9.549694368615746e-10
Solution: [0.0,350.145]
Residual value: [0.0,9.54969e-10]
Iter 1: ||f(x)|| = 14.0
Iter 2: ||f(x)|| = 0.1855077121987332
Iter 3: ||f(x)|| = 0.15150866346175462
Iter 4: ||f(x)|| = 0.00027749451055569807
Iter 5: ||f(x)|| = 9.358700481243432e-10
Solution: [0.0,350.17]
Residual value: [0.0,9.3587e-10]
Iter 1: ||f(x)|| = 16.0
Iter 2: ||f(x)|| = 0.19145534782819595
Iter 3: ||f(x)|| = 0.15129067244197358
Iter 4: ||f(x)|| = 0.0002766972893368802
Iter 5: ||f(x)|| = 9.24956111703068e-10
Solution: [0.0,350.194]
Residual value: [0.0,-9.24956e-10]
Iter 1: ||f(x)|| = 18.0
Iter 2: ||f(x)|| = 0.21538726630296878
Iter 3: ||f(x)|| = 0.15150045435530046

```



```

Iter 4: ||f(x)|| = 0.0002774644617602462
Iter 5: ||f(x)|| = 9.395080269314349e-10
Solution: [0.0,350.218]
Residual value: [0.0,-9.39508e-10]
Iter 1: ||f(x)|| = 20.0
Iter 2: ||f(x)|| = 0.23931918478228908
Iter 3: ||f(x)|| = 0.1515766800066558
Iter 4: ||f(x)|| = 0.0002777434774543508
Iter 5: ||f(x)|| = 9.358700481243432e-10
Solution: [0.0,350.242]
Residual value: [0.0,-9.3587e-10]
Iter 1: ||f(x)|| = 22.0
Iter 2: ||f(x)|| = 0.2632511032570619
Iter 3: ||f(x)|| = 0.15153117265708715
Iter 4: ||f(x)|| = 0.00027757689440477407
Iter 5: ||f(x)|| = 9.322320693172514e-10
Solution: [0.0,350.266]
Residual value: [0.0,-9.32232e-10]
Iter 1: ||f(x)|| = 24.0
Iter 2: ||f(x)|| = 0.2871830217363822
Iter 3: ||f(x)|| = 0.1512440642591173
Iter 4: ||f(x)|| = 0.0002765269882729626
Iter 5: ||f(x)|| = 9.304130799137056e-10
Solution: [0.0,350.291]
Residual value: [0.0,9.30413e-10]
Iter 1: ||f(x)|| = 26.0
Iter 2: ||f(x)|| = 0.311114940216612
Iter 3: ||f(x)|| = 0.15111675872594788
Iter 4: ||f(x)|| = 0.00027606208914221497
Iter 5: ||f(x)|| = 9.24956111703068e-10
Solution: [0.0,350.315]
Residual value: [0.0,-9.24956e-10]
Iter 1: ||f(x)|| = 28.0
Iter 2: ||f(x)|| = 0.3350468586959323
Iter 3: ||f(x)|| = 0.15063767036645004
Iter 4: ||f(x)|| = 0.0002743160448517301
Iter 5: ||f(x)|| = 9.1313268058002e-10
Solution: [0.0,350.339]
Residual value: [0.0,9.13133e-10]
Iter 1: ||f(x)|| = 30.0
Iter 2: ||f(x)|| = 0.3589787771752526
Iter 3: ||f(x)|| = 0.03725122642390488
Iter 4: ||f(x)|| = 0.001337818492174847
Iter 5: ||f(x)|| = 1.7873671822599135e-6
Iter 6: ||f(x)|| = 3.1946756635646406e-12
Solution: [3.19468e-12,350.363]
Residual value: [3.19468e-12,1.81899e-12]
Iter 1: ||f(x)|| = 32.0

```

```

Iter 2: ||f(x)|| = 0.38291069565093494
Iter 3: ||f(x)|| = 0.03242056563867546
Iter 4: ||f(x)|| = 0.0010180861509070382
Iter 5: ||f(x)|| = 1.0354460755479522e-6
Iter 6: ||f(x)|| = 1.0721465946751731e-12
Solution: [1.07215e-12,350.388]
Residual value: [1.07215e-12,0.0]
Iter 1: ||f(x)|| = 34.0
Iter 2: ||f(x)|| = 0.4068426141348027
Iter 3: ||f(x)|| = 0.02694003864780825
Iter 4: ||f(x)|| = 0.0007067264459692524
Iter 5: ||f(x)|| = 4.991095345226839e-7
Iter 6: ||f(x)|| = 3.637978807091713e-12
Solution: [0.0,350.412]
Residual value: [0.0,3.63798e-12]
Iter 1: ||f(x)|| = 36.0
Iter 2: ||f(x)|| = 0.43077453260957554
Iter 3: ||f(x)|| = 0.02084225549178258
Iter 4: ||f(x)|| = 0.0004255306002960424
Iter 5: ||f(x)|| = 1.81000359589234e-7
Iter 6: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.0,350.436]
Residual value: [0.0,-1.81899e-12]
Iter 1: ||f(x)|| = 38.0
Iter 2: ||f(x)|| = 0.45470645108889585
Iter 3: ||f(x)|| = 0.014157680317111954
Iter 4: ||f(x)|| = 0.0001976417634068639
Iter 5: ||f(x)|| = 3.905454775206634e-8
Iter 6: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.0,350.46]
Residual value: [0.0,1.81899e-12]
Iter 1: ||f(x)|| = 40.0
Iter 2: ||f(x)|| = 0.47863836956457817
Iter 3: ||f(x)|| = 0.006914804986081435
Iter 4: ||f(x)|| = 4.748617357108742e-5
Iter 5: ||f(x)|| = 2.2548294541719487e-9
Iter 6: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,350.484]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 42.0
Iter 2: ||f(x)|| = 0.502570288048446
Iter 3: ||f(x)|| = 0.003040422093363304
Iter 4: ||f(x)|| = 1.1195152183063328e-7
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,350.509]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 44.0
Iter 2: ||f(x)|| = 0.5265022065232188

```

```

Iter 3: ||f(x)|| = 0.0033359194649165147
Iter 4: ||f(x)|| = 1.3476346794050187e-7
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,350.533]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 46.0
Iter 2: ||f(x)|| = 0.5504341249979916
Iter 3: ||f(x)|| = 0.003645027495622344
Iter 4: ||f(x)|| = 1.609032551641576e-7
Iter 5: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.0,350.557]
Residual value: [0.0,1.81899e-12]
Iter 1: ||f(x)|| = 48.0
Iter 2: ||f(x)|| = 0.5743660434827689
Iter 3: ||f(x)|| = 0.003967734444813686
Iter 4: ||f(x)|| = 1.906619218061678e-7
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,350.581]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 50.0
Iter 2: ||f(x)|| = 0.5982979619575417
Iter 3: ||f(x)|| = 0.004304028554543038
Iter 4: ||f(x)|| = 2.2434414859162644e-7
Iter 5: ||f(x)|| = 0.0
Solution: [0.0,350.606]
Residual value: [0.0,0.0]
Iter 1: ||f(x)|| = 52.0
Iter 2: ||f(x)|| = 0.622229880436862
Iter 3: ||f(x)|| = 0.004653898127799039
Iter 4: ||f(x)|| = 2.6229281502310187e-7
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,350.63]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 54.0
Iter 2: ||f(x)|| = 0.6461617989125443
Iter 3: ||f(x)|| = 0.005017331425733573
Iter 4: ||f(x)|| = 3.0485534807667136e-7
Iter 5: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.0,350.654]
Residual value: [0.0,1.81899e-12]
Iter 1: ||f(x)|| = 56.0
Iter 2: ||f(x)|| = 0.6700937173964121
Iter 3: ||f(x)|| = 0.005394316757701745
Iter 4: ||f(x)|| = 3.523791747284122e-7
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,350.678]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 58.0

```

```

Iter 2: ||f(x)|| = 0.6940256358711849
Iter 3: ||f(x)|| = 0.005784842434877646
Iter 4: ||f(x)|| = 4.05258106184192e-7
Iter 5: ||f(x)|| = 4.547473508864641e-12
Solution: [0.0,350.702]
Residual value: [0.0,-4.54747e-12]
Iter 1: ||f(x)|| = 60.0
Iter 2: ||f(x)|| = 0.7179575543459578
Iter 3: ||f(x)|| = 0.0061888968102721265
Iter 4: ||f(x)|| = 4.638450263882987e-7
Iter 5: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.0,350.727]
Residual value: [0.0,-1.81899e-12]
Iter 1: ||f(x)|| = 62.0
Iter 2: ||f(x)|| = 0.7418894728261876
Iter 3: ||f(x)|| = 0.00660646818960231
Iter 4: ||f(x)|| = 5.285464794724248e-7
Iter 5: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.0,350.751]
Residual value: [0.0,2.72848e-12]
Iter 1: ||f(x)|| = 64.0
Iter 2: ||f(x)|| = 0.7658213913055079
Iter 3: ||f(x)|| = 0.007037544939521467
Iter 4: ||f(x)|| = 5.997681000735611e-7
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,350.775]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 66.0
Iter 2: ||f(x)|| = 0.7897533097848282
Iter 3: ||f(x)|| = 0.0074821154375968035
Iter 4: ||f(x)|| = 6.779273462598212e-7
Iter 5: ||f(x)|| = 0.0
Solution: [0.0,350.799]
Residual value: [0.0,0.0]
Iter 1: ||f(x)|| = 68.0
Iter 2: ||f(x)|| = 0.813685228259601
Iter 3: ||f(x)|| = 0.007940168067761988
Iter 4: ||f(x)|| = 7.634689609403722e-7
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,350.824]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 70.0
Iter 2: ||f(x)|| = 0.8376171467352833
Iter 3: ||f(x)|| = 0.008411691207584227
Iter 4: ||f(x)|| = 8.568395060137846e-7
Iter 5: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.0,350.848]
Residual value: [0.0,2.72848e-12]

```

```

Iter 1: ||f(x)|| = 72.0
Iter 2: ||f(x)|| = 0.8615490652236986
Iter 3: ||f(x)|| = 0.008896673284652934
Iter 4: ||f(x)|| = 9.58484633883927e-7
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,350.872]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 74.0
Iter 2: ||f(x)|| = 0.8854809836948334
Iter 3: ||f(x)|| = 0.009395102689268242
Iter 4: ||f(x)|| = 1.0688745533116162e-6
Iter 5: ||f(x)|| = 5.4569682106375694e-12
Solution: [0.0,350.896]
Residual value: [0.0,5.45697e-12]
Iter 1: ||f(x)|| = 76.0
Iter 2: ||f(x)|| = 0.9094129021787012
Iter 3: ||f(x)|| = 0.00990696789631329
Iter 4: ||f(x)|| = 1.1885194908245467e-6
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,350.92]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 78.0
Iter 2: ||f(x)|| = 0.933344820653474
Iter 3: ||f(x)|| = 0.010432257335196482
Iter 4: ||f(x)|| = 1.3178851077100262e-6
Iter 5: ||f(x)|| = 6.366462912410498e-12
Solution: [0.0,350.945]
Residual value: [0.0,-6.36646e-12]
Iter 1: ||f(x)|| = 80.0
Iter 2: ||f(x)|| = 0.9572767391337038
Iter 3: ||f(x)|| = 0.01097095945442561
Iter 4: ||f(x)|| = 1.4574925444321707e-6
Iter 5: ||f(x)|| = 8.185452315956354e-12
Solution: [0.0,350.969]
Residual value: [0.0,-8.18545e-12]
Iter 1: ||f(x)|| = 82.0
Iter 2: ||f(x)|| = 0.9812086576084766
Iter 3: ||f(x)|| = 0.011523062750711688
Iter 4: ||f(x)|| = 1.6078756743809208e-6
Iter 5: ||f(x)|| = 4.547473508864641e-12
Solution: [0.0,350.993]
Residual value: [0.0,-4.54747e-12]
Iter 1: ||f(x)|| = 84.0
Iter 2: ||f(x)|| = 1.005140576087797
Iter 3: ||f(x)|| = 0.012027471162582515
Iter 4: ||f(x)|| = 1.75170225702459e-6
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,351.017]

```

```

Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 86.0
Iter 2: ||f(x)|| = 1.0290724945725742
Iter 3: ||f(x)|| = 0.01231383952745091
Iter 4: ||f(x)|| = 1.8361088223173283e-6
Iter 5: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.0,351.042]
Residual value: [0.0,2.72848e-12]
Iter 1: ||f(x)|| = 88.0
Iter 2: ||f(x)|| = 1.053004413047347
Iter 3: ||f(x)|| = 0.01260020789140981
Iter 4: ||f(x)|| = 1.9224908101023175e-6
Iter 5: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.0,351.066]
Residual value: [0.0,1.81899e-12]
Iter 1: ||f(x)|| = 90.0
Iter 2: ||f(x)|| = 1.0769363315266673
Iter 3: ||f(x)|| = 0.012886576249911741
Iter 4: ||f(x)|| = 2.0108718672418036e-6
Iter 5: ||f(x)|| = 4.547473508864641e-12
Solution: [0.0,351.09]
Residual value: [0.0,-4.54747e-12]
Iter 1: ||f(x)|| = 92.0
Iter 2: ||f(x)|| = 1.1008682500014402
Iter 3: ||f(x)|| = 0.013172944605685188
Iter 4: ||f(x)|| = 2.101229256368242e-6
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,351.114]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 94.0
Iter 2: ||f(x)|| = 1.1248001684807605
Iter 3: ||f(x)|| = 0.013459312965096615
Iter 4: ||f(x)|| = 2.193572072428651e-6
Iter 5: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.0,351.138]
Residual value: [0.0,-1.81899e-12]
Iter 1: ||f(x)|| = 96.0
Iter 2: ||f(x)|| = 1.1487320869609903
Iter 3: ||f(x)|| = 0.013745681329055515
Iter 4: ||f(x)|| = 2.2878948584548198e-6
Iter 5: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.0,351.163]
Residual value: [0.0,1.81899e-12]
Iter 1: ||f(x)|| = 98.0
Iter 2: ||f(x)|| = 1.172664005435763
Iter 3: ||f(x)|| = 0.014032049688466941
Iter 4: ||f(x)|| = 2.384213075856678e-6
Iter 5: ||f(x)|| = 9.094947017729282e-13

```

```

Solution: [0.0,351.187]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 100.0
Iter 2: ||f(x)|| = 1.1965959239150834
Iter 3: ||f(x)|| = 0.014318418057882809
Iter 4: ||f(x)|| = 2.4825067157507874e-6
Iter 5: ||f(x)|| = 4.547473508864641e-12
Solution: [0.0,351.211]
Residual value: [0.0,-4.54747e-12]
Iter 1: ||f(x)|| = 102.0
Iter 2: ||f(x)|| = 1.2205278423944037
Iter 3: ||f(x)|| = 0.014604786417294235
Iter 4: ||f(x)|| = 2.5827912395470776e-6
Iter 5: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.0,351.235]
Residual value: [0.0,-1.81899e-12]
Iter 1: ||f(x)|| = 104.0
Iter 2: ||f(x)|| = 1.2444597608746335
Iter 3: ||f(x)|| = 0.014891154767610715
Iter 4: ||f(x)|| = 2.685061190277338e-6
Iter 5: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.0,351.26]
Residual value: [0.0,1.81899e-12]
Iter 1: ||f(x)|| = 106.0
Iter 2: ||f(x)|| = 1.2683916793494063
Iter 3: ||f(x)|| = 0.015177523136117088
Iter 4: ||f(x)|| = 2.789315658446867e-6
Iter 5: ||f(x)|| = 3.637978807091713e-12
Solution: [0.0,351.284]
Residual value: [0.0,-3.63798e-12]
Iter 1: ||f(x)|| = 108.0
Iter 2: ||f(x)|| = 1.2923235978287266
Iter 3: ||f(x)|| = 0.01546389149643801
Iter 4: ||f(x)|| = 2.8955519155715592e-6
Iter 5: ||f(x)|| = 0.0
Solution: [0.0,351.308]
Residual value: [0.0,0.0]
Iter 1: ||f(x)|| = 110.0
Iter 2: ||f(x)|| = 1.316255516308047
Iter 3: ||f(x)|| = 0.01575025985493994
Iter 4: ||f(x)|| = 3.0037872420507483e-6
Iter 5: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.0,351.332]
Residual value: [0.0,2.72848e-12]
Iter 1: ||f(x)|| = 112.0
Iter 2: ||f(x)|| = 1.3401874347828198
Iter 3: ||f(x)|| = 0.016036628215260862
Iter 4: ||f(x)|| = 3.1139934435486794e-6

```

```

Iter 5: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.0,351.356]
Residual value: [0.0,2.72848e-12]
Iter 1: ||f(x)|| = 114.0
Iter 2: ||f(x)|| = 1.3641193532630496
Iter 3: ||f(x)|| = 0.016322996583767235
Iter 4: ||f(x)|| = 3.2261896194540896e-6
Iter 5: ||f(x)|| = 3.637978807091713e-12
Solution: [0.0,351.381]
Residual value: [0.0,-3.63798e-12]
Iter 1: ||f(x)|| = 116.0
Iter 2: ||f(x)|| = 1.3880512717432794
Iter 3: ||f(x)|| = 0.01660936494317866
Iter 4: ||f(x)|| = 3.340372131788172e-6
Iter 5: ||f(x)|| = 0.0
Solution: [0.0,351.405]
Residual value: [0.0,0.0]
Iter 1: ||f(x)|| = 118.0
Iter 2: ||f(x)|| = 1.4119831902216902
Iter 3: ||f(x)|| = 0.016895733298042614
Iter 4: ||f(x)|| = 3.4565346140880138e-6
Iter 5: ||f(x)|| = 3.637978807091713e-12
Solution: [0.0,351.429]
Residual value: [0.0,3.63798e-12]
Iter 1: ||f(x)|| = 120.0
Iter 2: ||f(x)|| = 1.43591510870192
Iter 3: ||f(x)|| = 0.017182101658363536
Iter 4: ||f(x)|| = 3.5746879802900366e-6
Iter 5: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.0,351.453]
Residual value: [0.0,2.72848e-12]
Iter 1: ||f(x)|| = 122.0
Iter 2: ||f(x)|| = 1.4598470271766928
Iter 3: ||f(x)|| = 0.017468470022322435
Iter 4: ||f(x)|| = 3.694825863931328e-6
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,351.478]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 124.0
Iter 2: ||f(x)|| = 1.483778945656013
Iter 3: ||f(x)|| = 0.017754838386281335
Iter 4: ||f(x)|| = 3.816940079559572e-6
Iter 5: ||f(x)|| = 4.547473508864641e-12
Solution: [0.0,351.502]
Residual value: [0.0,-4.54747e-12]
Iter 1: ||f(x)|| = 126.0
Iter 2: ||f(x)|| = 1.5077108641353334
Iter 3: ||f(x)|| = 0.018041206750240235

```



```

Iter 4: ||f(x)|| = 3.941053364542313e-6
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,351.526]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 128.0
Iter 2: ||f(x)|| = 1.5316427826110157
Iter 3: ||f(x)|| = 0.018327575110561156
Iter 4: ||f(x)|| = 4.067142981512006e-6
Iter 5: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.0,351.55]
Residual value: [0.0,-1.81899e-12]
Iter 1: ||f(x)|| = 130.0
Iter 2: ||f(x)|| = 1.555574701086698
Iter 3: ||f(x)|| = 0.018613943469972583
Iter 4: ||f(x)|| = 4.195222572889179e-6
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,351.574]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 132.0
Iter 2: ||f(x)|| = 1.5795066195705658
Iter 3: ||f(x)|| = 0.018900311820289062
Iter 4: ||f(x)|| = 4.325283043726813e-6
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,351.599]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 134.0
Iter 2: ||f(x)|| = 1.6034385380498861
Iter 3: ||f(x)|| = 0.01918668019334291
Iter 4: ||f(x)|| = 4.457323484530207e-6
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,351.623]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 136.0
Iter 2: ||f(x)|| = 1.6273704565255684
Iter 3: ||f(x)|| = 0.019473048544568883
Iter 4: ||f(x)|| = 4.5913548092357814e-6
Iter 5: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.0,351.647]
Residual value: [0.0,-2.72848e-12]
Iter 1: ||f(x)|| = 138.0
Iter 2: ||f(x)|| = 1.6513023750003413
Iter 3: ||f(x)|| = 0.01975941691216576
Iter 4: ||f(x)|| = 4.727385203295853e-6
Iter 5: ||f(x)|| = 6.366462912410498e-12
Solution: [0.0,351.671]
Residual value: [0.0,6.36646e-12]
Iter 1: ||f(x)|| = 140.0
Iter 2: ||f(x)|| = 1.675234293484209

```

```

Iter 3: ||f(x)|| = 0.020045785272486683
Iter 4: ||f(x)|| = 4.865373739448842e-6
Iter 5: ||f(x)|| = 4.547473508864641e-12
Solution: [0.0,351.696]
Residual value: [0.0,4.54747e-12]
Iter 1: ||f(x)|| = 142.0
Iter 2: ||f(x)|| = 1.6991662119589819
Iter 3: ||f(x)|| = 0.020332153627350635
Iter 4: ||f(x)|| = 5.0053604354616255e-6
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,351.72]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 144.0
Iter 2: ||f(x)|| = 1.7230981304383022
Iter 3: ||f(x)|| = 0.02061852199585701
Iter 4: ||f(x)|| = 5.14733801537659e-6
Iter 5: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.0,351.744]
Residual value: [0.0,-1.81899e-12]
Iter 1: ||f(x)|| = 146.0
Iter 2: ||f(x)|| = 1.7470300489139845
Iter 3: ||f(x)|| = 0.02090489035072096
Iter 4: ||f(x)|| = 5.291295565257315e-6
Iter 5: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.0,351.768]
Residual value: [0.0,-2.72848e-12]
Iter 1: ||f(x)|| = 148.0
Iter 2: ||f(x)|| = 1.7709619673933048
Iter 3: ||f(x)|| = 0.02119125872013683
Iter 4: ||f(x)|| = 5.4372258091461845e-6
Iter 5: ||f(x)|| = 4.547473508864641e-12
Solution: [0.0,351.792]
Residual value: [0.0,-4.54747e-12]
Iter 1: ||f(x)|| = 150.0
Iter 2: ||f(x)|| = 1.794893885872625
Iter 3: ||f(x)|| = 0.02147762707045331
Iter 4: ||f(x)|| = 5.585149665421341e-6
Iter 5: ||f(x)|| = 0.0
Solution: [0.0,351.817]
Residual value: [0.0,0.0]
Iter 1: ||f(x)|| = 152.0
Iter 2: ||f(x)|| = 1.818825804352855
Iter 3: ||f(x)|| = 0.02176399543441221
Iter 4: ||f(x)|| = 5.735063496103976e-6
Iter 5: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.0,351.841]
Residual value: [0.0,-1.81899e-12]
Iter 1: ||f(x)|| = 154.0

```

```

Iter 2: ||f(x)|| = 1.8427577228276277
Iter 3: ||f(x)|| = 0.02205036378927616
Iter 4: ||f(x)|| = 5.886963663215283e-6
Iter 5: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.0,351.865]
Residual value: [0.0,1.81899e-12]
Iter 1: ||f(x)|| = 156.0
Iter 2: ||f(x)|| = 1.866689641306948
Iter 3: ||f(x)|| = 0.02233673215869203
Iter 4: ||f(x)|| = 6.040848347765859e-6
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,351.889]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 158.0
Iter 2: ||f(x)|| = 1.8906215597862683
Iter 3: ||f(x)|| = 0.02262310051719396
Iter 4: ||f(x)|| = 6.196709364303388e-6
Iter 5: ||f(x)|| = 1.000444171950221e-11
Solution: [0.0,351.914]
Residual value: [0.0,-1.00044e-11]
Iter 1: ||f(x)|| = 160.0
Iter 2: ||f(x)|| = 1.9145534782664981
Iter 3: ||f(x)|| = 0.022909468882062356
Iter 4: ||f(x)|| = 6.354560355248395e-6
Iter 5: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.0,351.938]
Residual value: [0.0,2.72848e-12]
Iter 1: ||f(x)|| = 162.0
Iter 2: ||f(x)|| = 1.938485396735814
Iter 3: ||f(x)|| = 0.023195837241473782
Iter 4: ||f(x)|| = 6.514387678180356e-6
Iter 5: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.0,351.962]
Residual value: [0.0,2.72848e-12]
Iter 1: ||f(x)|| = 164.0
Iter 2: ||f(x)|| = 1.9624173152205913
Iter 3: ||f(x)|| = 0.023482205605432682
Iter 4: ||f(x)|| = 6.676209522993304e-6
Iter 5: ||f(x)|| = 3.637978807091713e-12
Solution: [0.0,351.986]
Residual value: [0.0,-3.63798e-12]
Iter 1: ||f(x)|| = 166.0
Iter 2: ||f(x)|| = 1.9863492336999116
Iter 3: ||f(x)|| = 0.023768573960296635
Iter 4: ||f(x)|| = 6.840011337772012e-6
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,352.01]
Residual value: [0.0,-9.09495e-13]

```

```

Iter 1: ||f(x)|| = 168.0
Iter 2: ||f(x)|| = 2.0102811521801414
Iter 3: ||f(x)|| = 0.02405494232516503
Iter 4: ||f(x)|| = 7.005799488979392e-6
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,352.035]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 170.0
Iter 2: ||f(x)|| = 2.034213070654914
Iter 3: ||f(x)|| = 0.02434131068912393
Iter 4: ||f(x)|| = 7.173577614594251e-6
Iter 5: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.0,352.059]
Residual value: [0.0,2.72848e-12]
Iter 1: ||f(x)|| = 172.0
Iter 2: ||f(x)|| = 2.058144989138782
Iter 3: ||f(x)|| = 0.024627679048535356
Iter 4: ||f(x)|| = 7.343332072196063e-6
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,352.083]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 174.0
Iter 2: ||f(x)|| = 2.0820769076090073
Iter 3: ||f(x)|| = 0.02491404740339931
Iter 4: ||f(x)|| = 7.515066499763634e-6
Iter 5: ||f(x)|| = 0.0
Solution: [0.0,352.107]
Residual value: [0.0,0.0]
Iter 1: ||f(x)|| = 176.0
Iter 2: ||f(x)|| = 2.1060088260883276
Iter 3: ||f(x)|| = 0.02520041576735821
Iter 4: ||f(x)|| = 7.688795449212193e-6
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,352.132]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 178.0
Iter 2: ||f(x)|| = 2.129940744573105
Iter 3: ||f(x)|| = 0.02548678412767913
Iter 4: ||f(x)|| = 7.864506187615916e-6
Iter 5: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.0,352.156]
Residual value: [0.0,2.72848e-12]
Iter 1: ||f(x)|| = 180.0
Iter 2: ||f(x)|| = 2.1538726630478777
Iter 3: ||f(x)|| = 0.02577315249163803
Iter 4: ||f(x)|| = 8.042205990932416e-6
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,352.18]

```

```

Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 182.0
Iter 2: ||f(x)|| = 2.177804581527198
Iter 3: ||f(x)|| = 0.026059520860144403
Iter 4: ||f(x)|| = 8.221882126235869e-6
Iter 5: ||f(x)|| = 0.0
Solution: [0.0,352.204]
Residual value: [0.0,0.0]
Iter 1: ||f(x)|| = 184.0
Iter 2: ||f(x)|| = 2.201736500007428
Iter 3: ||f(x)|| = 0.026345889210460882
Iter 4: ||f(x)|| = 8.4035482359468e-6
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,352.228]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 186.0
Iter 2: ||f(x)|| = 2.225668418486748
Iter 3: ||f(x)|| = 0.026632257574419782
Iter 4: ||f(x)|| = 8.587200682086404e-6
Iter 5: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.0,352.253]
Residual value: [0.0,-2.72848e-12]
Iter 1: ||f(x)|| = 188.0
Iter 2: ||f(x)|| = 2.2496003369624304
Iter 3: ||f(x)|| = 0.02691862593383121
Iter 4: ||f(x)|| = 8.772836736170575e-6
Iter 5: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.0,352.277]
Residual value: [0.0,1.81899e-12]
Iter 1: ||f(x)|| = 190.0
Iter 2: ||f(x)|| = 2.2735322554417507
Iter 3: ||f(x)|| = 0.027204994298699603
Iter 4: ||f(x)|| = 8.960445484262891e-6
Iter 5: ||f(x)|| = 4.547473508864641e-12
Solution: [0.0,352.301]
Residual value: [0.0,-4.54747e-12]
Iter 1: ||f(x)|| = 192.0
Iter 2: ||f(x)|| = 2.297464173911976
Iter 3: ||f(x)|| = 0.027491362653563556
Iter 4: ||f(x)|| = 9.150048754236195e-6
Iter 5: ||f(x)|| = 8.185452315956354e-12
Solution: [0.0,352.325]
Residual value: [0.0,8.18545e-12]
Iter 1: ||f(x)|| = 194.0
Iter 2: ||f(x)|| = 2.321396092395844
Iter 3: ||f(x)|| = 0.027777731022979424
Iter 4: ||f(x)|| = 9.341641089122277e-6
Iter 5: ||f(x)|| = 2.7284841053187847e-12

```

Solution: [0.0,352.35]
 Residual value: [0.0,2.72848e-12]
 Iter 1: ||f(x)|| = 196.0
 Iter 2: ||f(x)|| = 2.3453280108760737
 Iter 3: ||f(x)|| = 0.028064099386938324
 Iter 4: ||f(x)|| = 9.535210665490013e-6
 Iter 5: ||f(x)|| = 1.8189894035458565e-12
 Solution: [0.0,352.374]
 Residual value: [0.0,1.81899e-12]
 Iter 1: ||f(x)|| = 198.0
 Iter 2: ||f(x)|| = 2.369259929355394
 Iter 3: ||f(x)|| = 0.02835046773634531
 Iter 4: ||f(x)|| = 9.730770216265228e-6
 Iter 5: ||f(x)|| = 9.094947017729282e-13
 Solution: [0.0,352.398]
 Residual value: [0.0,9.09495e-13]
 Iter 1: ||f(x)|| = 200.0
 Iter 2: ||f(x)|| = 2.3931918478256193
 Iter 3: ||f(x)|| = 0.028636836105761176
 Iter 4: ||f(x)|| = 9.928300642059185e-6
 Iter 5: ||f(x)|| = 5.4569682106375694e-12
 Solution: [0.0,352.422]
 Residual value: [0.0,-5.45697e-12]
 Iter 1: ||f(x)|| = 202.0
 Iter 2: ||f(x)|| = 2.417123766309487
 Iter 3: ||f(x)|| = 0.02892320446062513
 Iter 4: ||f(x)|| = 1.0127826499228831e-5
 Iter 5: ||f(x)|| = 6.366462912410498e-12
 Solution: [0.0,352.446]
 Residual value: [0.0,-6.36646e-12]
 Iter 1: ||f(x)|| = 204.0
 Iter 2: ||f(x)|| = 2.4410556847851694
 Iter 3: ||f(x)|| = 0.029209572820036556
 Iter 4: ||f(x)|| = 1.0329336873837747e-5
 Iter 5: ||f(x)|| = 2.7284841053187847e-12
 Solution: [0.0,352.471]
 Residual value: [0.0,-2.72848e-12]
 Iter 1: ||f(x)|| = 206.0
 Iter 2: ||f(x)|| = 2.464987603269037
 Iter 3: ||f(x)|| = 0.029495941189452424
 Iter 4: ||f(x)|| = 1.0532828127907123e-5
 Iter 5: ||f(x)|| = 9.094947017729282e-13
 Solution: [0.0,352.495]
 Residual value: [0.0,9.09495e-13]
 Iter 1: ||f(x)|| = 208.0
 Iter 2: ||f(x)|| = 2.4889195217483575
 Iter 3: ||f(x)|| = 0.02978230954886385
 Iter 4: ||f(x)|| = 1.073830480891047e-5

```

Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,352.519]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 210.0
Iter 2: ||f(x)|| = 2.5128514402231303
Iter 3: ||f(x)|| = 0.030068677903727803
Iter 4: ||f(x)|| = 1.094576327886898e-5
Iter 5: ||f(x)|| = 6.366462912410498e-12
Solution: [0.0,352.543]
Residual value: [0.0,-6.36646e-12]
Iter 1: ||f(x)|| = 212.0
Iter 2: ||f(x)|| = 2.5367833586988127
Iter 3: ||f(x)|| = 0.030355046267686703
Iter 4: ||f(x)|| = 1.1155210813740268e-5
Iter 5: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.0,352.568]
Residual value: [0.0,-2.72848e-12]
Iter 1: ||f(x)|| = 214.0
Iter 2: ||f(x)|| = 2.5607152771826804
Iter 3: ||f(x)|| = 0.030641414628007624
Iter 4: ||f(x)|| = 1.1366634680598509e-5
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,352.592]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 216.0
Iter 2: ||f(x)|| = 2.5846471956583628
Iter 3: ||f(x)|| = 0.03092778299105703
Iter 4: ||f(x)|| = 1.1580052159843035e-5
Iter 5: ||f(x)|| = 5.4569682106375694e-12
Solution: [0.0,352.616]
Residual value: [0.0,-5.45697e-12]
Iter 1: ||f(x)|| = 218.0
Iter 2: ||f(x)|| = 2.608579114132226
Iter 3: ||f(x)|| = 0.031214151350468455
Iter 4: ||f(x)|| = 1.1795446880569216e-5
Iter 5: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.0,352.64]
Residual value: [0.0,-1.81899e-12]
Iter 1: ||f(x)|| = 220.0
Iter 2: ||f(x)|| = 2.6325110326170034
Iter 3: ||f(x)|| = 0.031500519710789376
Iter 4: ||f(x)|| = 1.2012831575702876e-5
Iter 5: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.0,352.664]
Residual value: [0.0,-2.72848e-12]
Iter 1: ||f(x)|| = 222.0
Iter 2: ||f(x)|| = 2.656442951091776
Iter 3: ||f(x)|| = 0.0317868880702008

```

```

Iter 4: ||f(x)|| = 1.2232197150296997e-5
Iter 5: ||f(x)|| = 3.637978807091713e-12
Solution: [0.0,352.689]
Residual value: [0.0,-3.63798e-12]
Iter 1: ||f(x)|| = 224.0
Iter 2: ||f(x)|| = 2.6803748695710965
Iter 3: ||f(x)|| = 0.0320732564350692
Iter 4: ||f(x)|| = 1.2453542694856878e-5
Iter 5: ||f(x)|| = 4.547473508864641e-12
Solution: [0.0,352.713]
Residual value: [0.0,-4.54747e-12]
Iter 1: ||f(x)|| = 226.0
Iter 2: ||f(x)|| = 2.7043067880458693
Iter 3: ||f(x)|| = 0.032359624794480624
Iter 4: ||f(x)|| = 1.2676878213824239e-5
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,352.737]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 228.0
Iter 2: ||f(x)|| = 2.7282387065306466
Iter 3: ||f(x)|| = 0.03264599315389205
Iter 4: ||f(x)|| = 1.2902200069220271e-5
Iter 5: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.0,352.761]
Residual value: [0.0,-2.72848e-12]
Iter 1: ||f(x)|| = 230.0
Iter 2: ||f(x)|| = 2.752170625009967
Iter 3: ||f(x)|| = 0.03293236151785095
Iter 4: ||f(x)|| = 1.3129496437613852e-5
Iter 5: ||f(x)|| = 4.547473508864641e-12
Solution: [0.0,352.786]
Residual value: [0.0,-4.54747e-12]
Iter 1: ||f(x)|| = 232.0
Iter 2: ||f(x)|| = 2.7761025434847397
Iter 3: ||f(x)|| = 0.033218729877262376
Iter 4: ||f(x)|| = 1.3358774594962597e-5
Iter 5: ||f(x)|| = 0.0
Solution: [0.0,352.81]
Residual value: [0.0,0.0]
Iter 1: ||f(x)|| = 234.0
Iter 2: ||f(x)|| = 2.80003446196406
Iter 3: ||f(x)|| = 0.03350509824213077
Iter 4: ||f(x)|| = 1.3590051821665838e-5
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,352.834]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 236.0
Iter 2: ||f(x)|| = 2.823966380438833

```



```

Iter 3: ||f(x)|| = 0.0337914666015422
Iter 4: ||f(x)|| = 1.3823310837324243e-5
Iter 5: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.0,352.858]
Residual value: [0.0,-2.72848e-12]
Iter 1: ||f(x)|| = 238.0
Iter 2: ||f(x)|| = 2.8478982989190627
Iter 3: ||f(x)|| = 0.03407783495640615
Iter 4: ||f(x)|| = 1.4058548913453706e-5
Iter 5: ||f(x)|| = 8.185452315956354e-12
Solution: [0.0,352.882]
Residual value: [0.0,-8.18545e-12]
Iter 1: ||f(x)|| = 240.0
Iter 2: ||f(x)|| = 2.871830217398383
Iter 3: ||f(x)|| = 0.034364203315817576
Iter 4: ||f(x)|| = 1.4295768778538331e-5
Iter 5: ||f(x)|| = 4.547473508864641e-12
Solution: [0.0,352.907]
Residual value: [0.0,-4.54747e-12]
Iter 1: ||f(x)|| = 242.0
Iter 2: ||f(x)|| = 2.8957621358740653
Iter 3: ||f(x)|| = 0.03465057168432395
Iter 4: ||f(x)|| = 1.4534968613588717e-5
Iter 5: ||f(x)|| = 5.4569682106375694e-12
Solution: [0.0,352.931]
Residual value: [0.0,-5.45697e-12]
Iter 1: ||f(x)|| = 244.0
Iter 2: ||f(x)|| = 2.9196940543533856
Iter 3: ||f(x)|| = 0.034936940049192344
Iter 4: ||f(x)|| = 1.4776154785067774e-5
Iter 5: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.0,352.955]
Residual value: [0.0,-1.81899e-12]
Iter 1: ||f(x)|| = 246.0
Iter 2: ||f(x)|| = 2.9436259728336154
Iter 3: ||f(x)|| = 0.035223308413151244
Iter 4: ||f(x)|| = 1.501933547842782e-5
Iter 5: ||f(x)|| = 8.185452315956354e-12
Solution: [0.0,352.979]
Residual value: [0.0,-8.18545e-12]
Iter 1: ||f(x)|| = 248.0
Iter 2: ||f(x)|| = 2.967557891308388
Iter 3: ||f(x)|| = 0.0355096767680152
Iter 4: ||f(x)|| = 1.52644824993331e-5
Iter 5: ||f(x)|| = 4.547473508864641e-12
Solution: [0.0,353.003]
Residual value: [0.0,-4.54747e-12]
Iter 1: ||f(x)|| = 250.0

```

```

Iter 2: ||f(x)|| = 2.991489809792256
Iter 3: ||f(x)|| = 0.0357960451319741
Iter 4: ||f(x)|| = 1.5511629499087576e-5
Iter 5: ||f(x)|| = 5.4569682106375694e-12
Solution: [0.0,353.028]
Residual value: [0.0,-5.45697e-12]
Iter 1: ||f(x)|| = 252.0
Iter 2: ||f(x)|| = 3.015421728267029
Iter 3: ||f(x)|| = 0.03608241349229502
Iter 4: ||f(x)|| = 1.5760751921334304e-5
Iter 5: ||f(x)|| = 1.1823431123048067e-11
Solution: [0.0,353.052]
Residual value: [0.0,-1.18234e-11]
Iter 1: ||f(x)|| = 254.0
Iter 2: ||f(x)|| = 3.0393536467472586
Iter 3: ||f(x)|| = 0.03636878185625392
Iter 4: ||f(x)|| = 1.60118588610203e-5
Iter 5: ||f(x)|| = 8.185452315956354e-12
Solution: [0.0,353.076]
Residual value: [0.0,-8.18545e-12]
Iter 1: ||f(x)|| = 256.0
Iter 2: ||f(x)|| = 3.063285565226579
Iter 3: ||f(x)|| = 0.0366551502056609
Iter 4: ||f(x)|| = 1.626494758966146e-5
Iter 5: ||f(x)|| = 4.547473508864641e-12
Solution: [0.0,353.1]
Residual value: [0.0,-4.54747e-12]
Iter 1: ||f(x)|| = 258.0
Iter 2: ||f(x)|| = 3.087217483705899
Iter 3: ||f(x)|| = 0.03694151857143879
Iter 4: ||f(x)|| = 1.65200262927101e-5
Iter 5: ||f(x)|| = 5.4569682106375694e-12
Solution: [0.0,353.125]
Residual value: [0.0,-5.45697e-12]
Iter 1: ||f(x)|| = 260.0
Iter 2: ||f(x)|| = 3.111149402180672
Iter 3: ||f(x)|| = 0.03722788693903567
Iter 4: ||f(x)|| = 1.67770858752192e-5
Iter 5: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.0,353.149]
Residual value: [0.0,-2.72848e-12]
Iter 1: ||f(x)|| = 262.0
Iter 2: ||f(x)|| = 3.1350813206599923
Iter 3: ||f(x)|| = 0.03751425529389962
Iter 4: ||f(x)|| = 1.703612542769406e-5
Iter 5: ||f(x)|| = 8.185452315956354e-12
Solution: [0.0,353.173]
Residual value: [0.0,-8.18545e-12]

```

```

Iter 1: ||f(x)|| = 264.0
Iter 2: ||f(x)|| = 3.159013239136584
Iter 3: ||f(x)|| = 0.037800623654220544
Iter 4: ||f(x)|| = 1.729716495901812e-5
Iter 5: ||f(x)|| = 9.094947017729282e-12
Solution: [0.0,353.197]
Residual value: [0.0,-9.09495e-12]
Iter 1: ||f(x)|| = 266.0
Iter 2: ||f(x)|| = 3.1829451576104475
Iter 3: ||f(x)|| = 0.03808699201363197
Iter 4: ||f(x)|| = 1.75601662704139e-5
Iter 5: ||f(x)|| = 5.4569682106375694e-12
Solution: [0.0,353.221]
Residual value: [0.0,-5.45697e-12]
Iter 1: ||f(x)|| = 268.0
Iter 2: ||f(x)|| = 3.2068770760988627
Iter 3: ||f(x)|| = 0.03837336037759087
Iter 4: ||f(x)|| = 1.7825167560658883e-5
Iter 5: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.0,353.246]
Residual value: [0.0,-1.81899e-12]
Iter 1: ||f(x)|| = 270.0
Iter 2: ||f(x)|| = 3.2308089945754546
Iter 3: ||f(x)|| = 0.03865972873791179
Iter 4: ||f(x)|| = 1.8092139725922607e-5
Iter 5: ||f(x)|| = 7.275957614183426e-12
Solution: [0.0,353.27]
Residual value: [0.0,-7.27596e-12]
Iter 1: ||f(x)|| = 272.0
Iter 2: ||f(x)|| = 3.254740913054775
Iter 3: ||f(x)|| = 0.038946097106418165
Iter 4: ||f(x)|| = 1.836110277508851e-5
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,353.294]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 274.0
Iter 2: ||f(x)|| = 3.2786728315240907
Iter 3: ||f(x)|| = 0.03923246546128212
Iter 4: ||f(x)|| = 1.8632045794220176e-5
Iter 5: ||f(x)|| = 9.094947017729282e-13
Solution: [0.0,353.318]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 276.0
Iter 2: ||f(x)|| = 3.302604750003411
Iter 3: ||f(x)|| = 0.03951883382524102
Iter 4: ||f(x)|| = 1.8904977878264617e-5
Iter 5: ||f(x)|| = 6.366462912410498e-12
Solution: [0.0,353.343]

```

```

Residual value: [0.0,-6.36646e-12]
Iter 1: ||f(x)|| = 278.0
Iter 2: ||f(x)|| = 3.3265366684881883
Iter 3: ||f(x)|| = 0.039805202184652444
Iter 4: ||f(x)|| = 1.9179891751264222e-5
Iter 5: ||f(x)|| = 6.366462912410498e-12
Solution: [0.0,353.367]
Residual value: [0.0,-6.36646e-12]
Iter 1: ||f(x)|| = 280.0
Iter 2: ||f(x)|| = 3.3504685869584137
Iter 3: ||f(x)|| = 0.0400915705395164
Iter 4: ||f(x)|| = 1.945677740877727e-5
Iter 5: ||f(x)|| = 3.637978807091713e-12
Solution: [0.0,353.391]
Residual value: [0.0,-3.63798e-12]
Iter 1: ||f(x)|| = 282.0
Iter 2: ||f(x)|| = 3.3744005054386434
Iter 3: ||f(x)|| = 0.04037793890438479
Iter 4: ||f(x)|| = 1.9735656678676605e-5
Iter 5: ||f(x)|| = 4.547473508864641e-12
Solution: [0.0,353.415]
Residual value: [0.0,-4.54747e-12]
Iter 1: ||f(x)|| = 284.0
Iter 2: ||f(x)|| = 3.3983324239179638
Iter 3: ||f(x)|| = 0.040664307272891165
Iter 4: ||f(x)|| = 2.00165168280364e-5
Iter 5: ||f(x)|| = 6.366462912410498e-12
Solution: [0.0,353.439]
Residual value: [0.0,-6.36646e-12]
Iter 1: ||f(x)|| = 286.0
Iter 2: ||f(x)|| = 3.4222643423927366
Iter 3: ||f(x)|| = 0.04095067562775512
Iter 4: ||f(x)|| = 2.029936786129838e-5
Iter 5: ||f(x)|| = 8.185452315956354e-12
Solution: [0.0,353.464]
Residual value: [0.0,-8.18545e-12]
Iter 1: ||f(x)|| = 288.0
Iter 2: ||f(x)|| = 3.446196260877514
Iter 3: ||f(x)|| = 0.04123704398261907
Iter 4: ||f(x)|| = 2.0584199774020817e-5
Iter 5: ||f(x)|| = 3.637978807091713e-12
Solution: [0.0,353.488]
Residual value: [0.0,-3.63798e-12]
Iter 1: ||f(x)|| = 290.0
Iter 2: ||f(x)|| = 3.4701281793522867
Iter 3: ||f(x)|| = 0.041523412351125444
Iter 4: ||f(x)|| = 2.0871006199740805e-5
Iter 5: ||f(x)|| = 9.094947017729282e-12

```

Solution: [0.0,353.512]
 Residual value: [0.0,-9.09495e-12]
 Iter 1: ||f(x)|| = 292.0
 Iter 2: ||f(x)|| = 3.4940600978361545
 Iter 3: ||f(x)|| = 0.041809780711446365
 Iter 4: ||f(x)|| = 2.1159798961889464e-5
 Iter 5: ||f(x)|| = 6.366462912410498e-12
 Solution: [0.0,353.536]
 Residual value: [0.0,-6.36646e-12]
 Iter 1: ||f(x)|| = 294.0
 Iter 2: ||f(x)|| = 3.5179920163109273
 Iter 3: ||f(x)|| = 0.04209614907085779
 Iter 4: ||f(x)|| = 2.1450581698445603e-5
 Iter 5: ||f(x)|| = 2.7284841053187847e-12
 Solution: [0.0,353.561]
 Residual value: [0.0,-2.72848e-12]
 Iter 1: ||f(x)|| = 296.0
 Iter 2: ||f(x)|| = 3.5419239347857
 Iter 3: ||f(x)|| = 0.04238251743481669
 Iter 4: ||f(x)|| = 2.1743345314462204e-5
 Iter 5: ||f(x)|| = 3.637978807091713e-12
 Solution: [0.0,353.585]
 Residual value: [0.0,-3.63798e-12]
 Iter 1: ||f(x)|| = 298.0
 Iter 2: ||f(x)|| = 3.5658558532704774
 Iter 3: ||f(x)|| = 0.04266888579422812
 Iter 4: ||f(x)|| = 2.2038079805497546e-5
 Iter 5: ||f(x)|| = 4.547473508864641e-12
 Solution: [0.0,353.609]
 Residual value: [0.0,-4.54747e-12]
 Iter 1: ||f(x)|| = 300.0
 Iter 2: ||f(x)|| = 3.5897877717497977
 Iter 3: ||f(x)|| = 0.04295525415454904
 Iter 4: ||f(x)|| = 2.2334813365887385e-5
 Iter 5: ||f(x)|| = 5.4569682106375694e-12
 Solution: [0.0,353.633]
 Residual value: [0.0,-5.45697e-12]
 Iter 1: ||f(x)|| = 302.0
 Iter 2: ||f(x)|| = 3.6137196902245705
 Iter 3: ||f(x)|| = 0.04324162251850794
 Iter 4: ||f(x)|| = 2.2633518710790668e-5
 Iter 5: ||f(x)|| = 6.366462912410498e-12
 Solution: [0.0,353.657]
 Residual value: [0.0,-6.36646e-12]
 Iter 1: ||f(x)|| = 304.0
 Iter 2: ||f(x)|| = 3.6376516087048003
 Iter 3: ||f(x)|| = 0.04352799087337189
 Iter 4: ||f(x)|| = 2.293421493959613e-5

```

Iter 5: ||f(x)|| = 8.185452315956354e-12
Solution: [0.0,353.682]
Residual value: [0.0,-8.18545e-12]
Iter 1: ||f(x)|| = 306.0
Iter 2: ||f(x)|| = 3.6615835271841206
Iter 3: ||f(x)|| = 0.04381435923733079
Iter 4: ||f(x)|| = 2.3236895685840864e-5
Iter 5: ||f(x)|| = 1.3642420526593924e-11
Solution: [0.0,353.706]
Residual value: [0.0,-1.36424e-11]
Iter 1: ||f(x)|| = 308.0
Iter 2: ||f(x)|| = 3.685515445654346
Iter 3: ||f(x)|| = 0.044100727592194744
Iter 4: ||f(x)|| = 2.3541562768514268e-5
Iter 5: ||f(x)|| = 1.000444171950221e-11
Solution: [0.0,353.73]
Residual value: [0.0,-1.00044e-11]
Iter 1: ||f(x)|| = 310.0
Iter 2: ||f(x)|| = 3.7094473641382137
Iter 3: ||f(x)|| = 0.044387095956153644
Iter 4: ||f(x)|| = 2.3848200726206414e-5
Iter 5: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.0,353.754]
Residual value: [0.0,2.72848e-12]
Iter 1: ||f(x)|| = 312.0
Iter 2: ||f(x)|| = 3.7333792826184435
Iter 3: ||f(x)|| = 0.04467346432102204
Iter 4: ||f(x)|| = 2.415683320577955e-5
Iter 5: ||f(x)|| = 8.185452315956354e-12
Solution: [0.0,353.779]
Residual value: [0.0,-8.18545e-12]
Iter 1: ||f(x)|| = 314.0
Iter 2: ||f(x)|| = 3.7573112010932164
Iter 3: ||f(x)|| = 0.044959832680433465
Iter 4: ||f(x)|| = 2.4467440198350232e-5
Iter 5: ||f(x)|| = 4.547473508864641e-12
Solution: [0.0,353.803]
Residual value: [0.0,-4.54747e-12]
Iter 1: ||f(x)|| = 316.0
Iter 2: ||f(x)|| = 3.781243119573446
Iter 3: ||f(x)|| = 0.04524620103984489
Iter 4: ||f(x)|| = 2.478003443684429e-5
Iter 5: ||f(x)|| = 5.4569682106375694e-12
Solution: [0.0,353.827]
Residual value: [0.0,-5.45697e-12]
Iter 1: ||f(x)|| = 318.0
Iter 2: ||f(x)|| = 3.8051750380564044
Iter 3: ||f(x)|| = 0.04553256941380823

```

Iter 4: $\|f(x)\| = 2.5094614102272317e-5$
 Iter 5: $\|f(x)\| = 6.366462912410498e-12$
 Solution: [0.0, 353.851]
 Residual value: [0.0, -6.36646e-12]
 Iter 1: $\|f(x)\| = 320.0$
 Iter 2: $\|f(x)\| = 3.8291069565320868$
 Iter 3: $\|f(x)\| = 0.04581893776412471$
 Iter 4: $\|f(x)\| = 2.5411173737666104e-5$
 Iter 5: $\|f(x)\| = 8.185452315956354e-12$
 Solution: [0.0, 353.875]
 Residual value: [0.0, -8.18545e-12]
 Iter 1: $\|f(x)\| = 322.0$
 Iter 2: $\|f(x)\| = 3.8530388750068596$
 Iter 3: $\|f(x)\| = 0.04610530612353614$
 Iter 4: $\|f(x)\| = 2.572971879999386e-5$
 Iter 5: $\|f(x)\| = 9.094947017729282e-12$
 Solution: [0.0, 353.9]
 Residual value: [0.0, -9.09495e-12]
 Iter 1: $\|f(x)\| = 324.0$
 Iter 2: $\|f(x)\| = 3.8769707934870894$
 Iter 3: $\|f(x)\| = 0.046391674477490596$
 Iter 4: $\|f(x)\| = 2.605024928925559e-5$
 Iter 5: $\|f(x)\| = 5.4569682106375694e-12$
 Solution: [0.0, 353.924]
 Residual value: [0.0, -5.45697e-12]
 Iter 1: $\|f(x)\| = 326.0$
 Iter 2: $\|f(x)\| = 3.9009027119664097$
 Iter 3: $\|f(x)\| = 0.04667804284235899$
 Iter 4: $\|f(x)\| = 2.6372747925051954e-5$
 Iter 5: $\|f(x)\| = 6.366462912410498e-12$
 Solution: [0.0, 353.948]
 Residual value: [0.0, -6.36646e-12]
 Iter 1: $\|f(x)\| = 328.0$
 Iter 2: $\|f(x)\| = 3.92483463044573$
 Iter 3: $\|f(x)\| = 0.04696441121177486$
 Iter 4: $\|f(x)\| = 2.669724381121341e-5$
 Iter 5: $\|f(x)\| = 7.275957614183426e-12$
 Solution: [0.0, 353.972]
 Residual value: [0.0, -7.27596e-12]
 Iter 1: $\|f(x)\| = 330.0$
 Iter 2: $\|f(x)\| = 3.948766548920503$
 Iter 3: $\|f(x)\| = 0.047250779571186285$
 Iter 4: $\|f(x)\| = 2.7023716938856523e-5$
 Iter 5: $\|f(x)\| = 3.637978807091713e-12$
 Solution: [0.0, 353.997]
 Residual value: [0.0, -3.63798e-12]
 Iter 1: $\|f(x)\| = 332.0$
 Iter 2: $\|f(x)\| = 3.97269846740528$

```

Iter 3: ||f(x)|| = 0.04753714792605024
Iter 4: ||f(x)|| = 2.7352174583938904e-5
Iter 5: ||f(x)|| = 1.3642420526593924e-11
Solution: [0.0,354.021]
Residual value: [0.0,-1.36424e-11]
Iter 1: ||f(x)|| = 334.0
Iter 2: ||f(x)|| = 3.9966303858791434
Iter 3: ||f(x)|| = 0.04782351629000914
Iter 4: ||f(x)|| = 2.7682617655955255e-5
Iter 5: ||f(x)|| = 6.366462912410498e-12
Solution: [0.0,354.045]
Residual value: [0.0,-6.36646e-12]
Iter 1: ||f(x)|| = 336.0
Iter 2: ||f(x)|| = 4.020562304359373
Iter 3: ||f(x)|| = 0.04810988465487753
Iter 4: ||f(x)|| = 2.801504251692677e-5
Iter 5: ||f(x)|| = 1.1823431123048067e-11
Solution: [0.0,354.069]
Residual value: [0.0,-1.18234e-11]
Iter 1: ||f(x)|| = 338.0
Iter 2: ||f(x)|| = 4.044494222829599
Iter 3: ||f(x)|| = 0.04839625301428896
Iter 4: ||f(x)|| = 2.8349457352305762e-5
Iter 5: ||f(x)|| = 3.637978807091713e-12
Solution: [0.0,354.093]
Residual value: [0.0,-3.63798e-12]
Iter 1: ||f(x)|| = 340.0
Iter 2: ||f(x)|| = 4.068426141314376
Iter 3: ||f(x)|| = 0.04868262137279089
Iter 4: ||f(x)|| = 2.8685842153208796e-5
Iter 5: ||f(x)|| = 1.4551915228366852e-11
Solution: [0.0,354.118]
Residual value: [0.0,-1.45519e-11]
Iter 1: ||f(x)|| = 342.0
Iter 2: ||f(x)|| = 4.092358059793696
Iter 3: ||f(x)|| = 0.04896898974220676
Iter 4: ||f(x)|| = 2.90242132905405e-5
Iter 5: ||f(x)|| = 1.546140993013978e-11
Solution: [0.0,354.142]
Residual value: [0.0,-1.54614e-11]
Iter 1: ||f(x)|| = 344.0
Iter 2: ||f(x)|| = 4.116289978268469
Iter 3: ||f(x)|| = 0.049255358101618185
Iter 4: ||f(x)|| = 2.9364569854806177e-5
Iter 5: ||f(x)|| = 1.1823431123048067e-11
Solution: [0.0,354.166]
Residual value: [0.0,-1.18234e-11]
Iter 1: ||f(x)|| = 346.0

```



```

Iter 2: ||f(x)|| = 4.140221896747789
Iter 3: ||f(x)|| = 0.04954172645648214
Iter 4: ||f(x)|| = 2.9706906389037613e-5
Iter 5: ||f(x)|| = 1.3642420526593924e-11
Solution: [0.0,354.19]
Residual value: [0.0,-1.36424e-11]
Iter 1: ||f(x)|| = 348.0
Iter 2: ||f(x)|| = 4.164153815228019
Iter 3: ||f(x)|| = 0.04982809482135053
Iter 4: ||f(x)|| = 3.005122925969772e-5
Iter 5: ||f(x)|| = 9.094947017729282e-12
Solution: [0.0,354.215]
Residual value: [0.0,-9.09495e-12]
Iter 1: ||f(x)|| = 350.0
Iter 2: ||f(x)|| = 4.188085733702792
Iter 3: ||f(x)|| = 0.05011446318076196
Iter 4: ||f(x)|| = 3.039752755285008e-5
Iter 5: ||f(x)|| = 1.546140993013978e-11
Solution: [0.0,354.239]
Residual value: [0.0,-1.54614e-11]
Iter 1: ||f(x)|| = 352.0
Iter 2: ||f(x)|| = 4.212017652182112
Iter 3: ||f(x)|| = 0.05040083153562591
Iter 4: ||f(x)|| = 3.074581672990462e-5
Iter 5: ||f(x)|| = 1.1823431123048067e-11
Solution: [0.0,354.263]
Residual value: [0.0,-1.18234e-11]
Iter 1: ||f(x)|| = 354.0
Iter 2: ||f(x)|| = 4.2359495706614325
Iter 3: ||f(x)|| = 0.05068719989958481
Iter 4: ||f(x)|| = 3.10960758724832e-5
Iter 5: ||f(x)|| = 1.2732925824820995e-11
Solution: [0.0,354.287]
Residual value: [0.0,-1.27329e-11]
Iter 1: ||f(x)|| = 356.0
Iter 2: ||f(x)|| = 4.259881489141662
Iter 3: ||f(x)|| = 0.05097356825899624
Iter 4: ||f(x)|| = 3.1448339541384485e-5
Iter 5: ||f(x)|| = 9.094947017729282e-12
Solution: [0.0,354.311]
Residual value: [0.0,-9.09495e-12]
Iter 1: ||f(x)|| = 358.0
Iter 2: ||f(x)|| = 4.283813407620983
Iter 3: ||f(x)|| = 0.05125993662386463
Iter 4: ||f(x)|| = 3.1802570447325706e-5
Iter 5: ||f(x)|| = 1.0913936421275139e-11
Solution: [0.0,354.336]
Residual value: [0.0,-1.09139e-11]

```

```

Iter 1: ||f(x)|| = 360.0
Iter 2: ||f(x)|| = 4.307745326096665
Iter 3: ||f(x)|| = 0.05154630498782353
Iter 4: ||f(x)|| = 3.21587867802009e-5
Iter 5: ||f(x)|| = 1.1823431123048067e-11
Solution: [0.0,354.36]
Residual value: [0.0,-1.18234e-11]
Iter 1: ||f(x)|| = 362.0
Iter 2: ||f(x)|| = 4.331677244575985
Iter 3: ||f(x)|| = 0.051832673342687485
Iter 4: ||f(x)|| = 3.251698308304185e-5
Iter 5: ||f(x)|| = 1.1823431123048067e-11
Solution: [0.0,354.384]
Residual value: [0.0,-1.18234e-11]
Iter 1: ||f(x)|| = 364.0
Iter 2: ||f(x)|| = 4.355609163050758
Iter 3: ||f(x)|| = 0.05211904171119386
Iter 4: ||f(x)|| = 3.287717026978498e-5
Iter 5: ||f(x)|| = 9.094947017729282e-12
Solution: [0.0,354.408]
Residual value: [0.0,-9.09495e-12]
Iter 1: ||f(x)|| = 366.0
Iter 2: ||f(x)|| = 4.379541081525531
Iter 3: ||f(x)|| = 0.05240541005787236
Iter 4: ||f(x)|| = 3.3239337426493876e-5
Iter 5: ||f(x)|| = 1.4551915228366852e-11
Solution: [0.0,354.433]
Residual value: [0.0,-1.45519e-11]
Iter 1: ||f(x)|| = 368.0
Iter 2: ||f(x)|| = 4.403473000010308
Iter 3: ||f(x)|| = 0.052691778420921764
Iter 4: ||f(x)|| = 3.360348546266323e-5
Iter 5: ||f(x)|| = 1.1823431123048067e-11
Solution: [0.0,354.457]
Residual value: [0.0,-1.18234e-11]
Iter 1: ||f(x)|| = 370.0
Iter 2: ||f(x)|| = 4.4274049184896285
Iter 3: ||f(x)|| = 0.05297814678579016
Iter 4: ||f(x)|| = 3.3969609830819536e-5
Iter 5: ||f(x)|| = 8.185452315956354e-12
Solution: [0.0,354.481]
Residual value: [0.0,-8.18545e-12]
Iter 1: ||f(x)|| = 372.0
Iter 2: ||f(x)|| = 4.451336836964401
Iter 3: ||f(x)|| = 0.05326451515429653
Iter 4: ||f(x)|| = 3.433772417338332e-5
Iter 5: ||f(x)|| = 1.8313585314899683e-8
Iter 6: ||f(x)|| = 8.049116928532385e-16

```

Solution: [0.00097093, 354.505]
 Residual value: [8.04912e-16, 0.0]
 Iter 1: ||f(x)|| = 374.0
 Iter 2: ||f(x)|| = 4.475268755443722
 Iter 3: ||f(x)|| = 0.053550883509160485
 Iter 4: ||f(x)|| = 0.0004579603019010392
 Iter 5: ||f(x)|| = 3.199235834472347e-6
 Iter 6: ||f(x)|| = 1.0368239600211382e-10
 Solution: [0.0155682, 354.529]
 Residual value: [-7.43722e-11, -1.03682e-10]
 Iter 1: ||f(x)|| = 376.0
 Iter 2: ||f(x)|| = 4.499200673923951
 Iter 3: ||f(x)|| = 0.053837251873119385
 Iter 4: ||f(x)|| = 0.0008895840055629378
 Iter 5: ||f(x)|| = 1.1856355740746949e-5
 Iter 6: ||f(x)|| = 1.329681253992021e-9
 Iter 7: ||f(x)|| = 2.7284841053187847e-12
 Solution: [0.0299637, 354.554]
 Residual value: [-7.21645e-16, -2.72848e-12]
 Iter 1: ||f(x)|| = 378.0
 Iter 2: ||f(x)|| = 4.523132592403272
 Iter 3: ||f(x)|| = 0.05412362023253081
 Iter 4: ||f(x)|| = 0.0013231309867478558
 Iter 5: ||f(x)|| = 2.576685892563546e-5
 Iter 6: ||f(x)|| = 6.2173057813197374e-9
 Iter 7: ||f(x)|| = 2.7284841053187847e-12
 Solution: [0.044162, 354.578]
 Residual value: [6.10623e-16, -2.72848e-12]
 Iter 1: ||f(x)|| = 380.0
 Iter 2: ||f(x)|| = 4.5470645108780445
 Iter 3: ||f(x)|| = 0.0544099885983087
 Iter 4: ||f(x)|| = 0.0017585651748959208
 Iter 5: ||f(x)|| = 4.472409000300104e-5
 Iter 6: ||f(x)|| = 1.8562786863185465e-8
 Iter 7: ||f(x)|| = 9.094947017729282e-13
 Solution: [0.058168, 354.602]
 Residual value: [1.01308e-15, 9.09495e-13]
 Iter 1: ||f(x)|| = 382.0
 Iter 2: ||f(x)|| = 4.570996429362822
 Iter 3: ||f(x)|| = 0.05469635695681063
 Iter 4: ||f(x)|| = 0.0021958507250019466
 Iter 5: ||f(x)|| = 6.853120976302307e-5
 Iter 6: ||f(x)|| = 4.317644197726622e-8
 Iter 7: ||f(x)|| = 9.094947017729282e-13
 Solution: [0.0719861, 354.626]
 Residual value: [4.996e-15, -9.09495e-13]
 Iter 1: ||f(x)|| = 384.0
 Iter 2: ||f(x)|| = 4.594928347833047

```

Iter 3: ||f(x)|| = 0.0549827253262265
Iter 4: ||f(x)|| = 0.0026349520148869487
Iter 5: ||f(x)|| = 9.70006412899238e-5
Iter 6: ||f(x)|| = 8.570623322157189e-8
Iter 7: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.0856208,354.651]
Residual value: [-5.50532e-14,2.72848e-12]
Iter 1: ||f(x)|| = 386.0
Iter 2: ||f(x)|| = 4.6188602663123675
Iter 3: ||f(x)|| = 0.05526909368109045
Iter 4: ||f(x)|| = 0.0030758337215957
Iter 5: ||f(x)|| = 0.0001299536943406565
Iter 6: ||f(x)|| = 1.5241221262840554e-7
Iter 7: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.0990763,354.675]
Residual value: [-1.74527e-13,2.72848e-12]
Iter 1: ||f(x)|| = 388.0
Iter 2: ||f(x)|| = 4.642792184792597
Iter 3: ||f(x)|| = 0.05555546204050188
Iter 4: ||f(x)|| = 0.003518460718623828
Iter 5: ||f(x)|| = 0.0001672200041866745
Iter 6: ||f(x)|| = 2.500501068425365e-7
Iter 7: ||f(x)|| = 9.094947017729282e-13
Solution: [0.112357,354.699]
Residual value: [-4.58827e-13,9.09495e-13]
Iter 1: ||f(x)|| = 390.0
Iter 2: ||f(x)|| = 4.666724103271918
Iter 3: ||f(x)|| = 0.05584183040991775
Iter 4: ||f(x)|| = 0.003962798148677393
Iter 5: ||f(x)|| = 0.00020863728332187748
Iter 6: ||f(x)|| = 3.856912371702492e-7
Iter 7: ||f(x)|| = 3.637978807091713e-12
Solution: [0.125466,354.723]
Residual value: [-1.07556e-12,3.63798e-12]
Iter 1: ||f(x)|| = 392.0
Iter 2: ||f(x)|| = 4.690656021751238
Iter 3: ||f(x)|| = 0.05612819875477726
Iter 4: ||f(x)|| = 0.004408811407301982
Iter 5: ||f(x)|| = 0.00025405077758478
Iter 6: ||f(x)|| = 5.666533979820088e-7
Iter 7: ||f(x)|| = 1.0913936421275139e-11
Solution: [0.138409,354.747]
Residual value: [-2.28391e-12,-1.09139e-11]
Iter 1: ||f(x)|| = 394.0
Iter 2: ||f(x)|| = 4.714587940231468
Iter 3: ||f(x)|| = 0.05641456711964565
Iter 4: ||f(x)|| = 0.004856466130149784
Iter 5: ||f(x)|| = 0.0003033130187759525

```

```

Iter 6: ||f(x)|| = 8.003717084648088e-7
Iter 7: ||f(x)|| = 4.493419525353204e-12
Solution: [0.151188, 354.772]
Residual value: [-4.49342e-12, -2.72848e-12]
Iter 1: ||f(x)|| = 396.0
Iter 2: ||f(x)|| = 4.7385198587007835
Iter 3: ||f(x)|| = 0.05670093548815203
Iter 4: ||f(x)|| = 0.005305728206622007
Iter 5: ||f(x)|| = 0.00035628342811833136
Iter 6: ||f(x)|| = 1.0943267625407316e-6
Iter 7: ||f(x)|| = 1.4551915228366852e-11
Solution: [0.163807, 354.796]
Residual value: [-8.26289e-12, -1.45519e-11]
Iter 1: ||f(x)|| = 398.0
Iter 2: ||f(x)|| = 4.762451777185561
Iter 3: ||f(x)|| = 0.056987303852110927
Iter 4: ||f(x)|| = 0.005756563781687873
Iter 5: ||f(x)|| = 0.0004128279915676103
Iter 6: ||f(x)|| = 1.4559827832272276e-6
Iter 7: ||f(x)|| = 1.4399981207446899e-11
Solution: [0.17627, 354.82]
Residual value: [-1.44e-11, -1.36424e-11]
Iter 1: ||f(x)|| = 400.0
Iter 2: ||f(x)|| = 4.786383695664881
Iter 3: ||f(x)|| = 0.05727367219787993
Iter 4: ||f(x)|| = 0.004319043021496327
Iter 5: ||f(x)|| = 0.00023309416883421363
Iter 6: ||f(x)|| = 4.4829539547208697e-7
Iter 7: ||f(x)|| = 6.366462912410498e-12
Solution: [0.188581, 354.844]
Residual value: [-1.34907e-12, -6.36646e-12]
Iter 1: ||f(x)|| = 402.0
Iter 2: ||f(x)|| = 4.810315614139654
Iter 3: ||f(x)|| = 0.057560040566386306
Iter 4: ||f(x)|| = 0.0047482066320299054
Iter 5: ||f(x)|| = 0.0002773721180346911
Iter 6: ||f(x)|| = 6.292430043686181e-7
Iter 7: ||f(x)|| = 7.275957614183426e-12
Solution: [0.200742, 354.869]
Residual value: [-2.6231e-12, -7.27596e-12]
Iter 1: ||f(x)|| = 404.0
Iter 2: ||f(x)|| = 4.834247532619884
Iter 3: ||f(x)|| = 0.05784640892670723
Iter 4: ||f(x)|| = 0.005178809434255527
Iter 5: ||f(x)|| = 0.0003249279034207575
Iter 6: ||f(x)|| = 8.559863999835216e-7
Iter 7: ||f(x)|| = 8.185452315956354e-12
Solution: [0.212758, 354.893]

```

```

Residual value: [-4.77397e-12,-8.18545e-12]
Iter 1: ||f(x)|| = 406.0
Iter 2: ||f(x)|| = 4.858179451099204
Iter 3: ||f(x)|| = 0.0581327772952136
Iter 4: ||f(x)|| = 0.0056108211447281064
Iter 5: ||f(x)|| = 0.0003756463265744969
Iter 6: ||f(x)|| = 1.1341480785631575e-6
Iter 7: ||f(x)|| = 1.4551915228366852e-11
Solution: [0.22463,354.917]
Residual value: [-8.25848e-12,-1.45519e-11]
Iter 1: ||f(x)|| = 408.0
Iter 2: ||f(x)|| = 4.882111369578524
Iter 3: ||f(x)|| = 0.05841914565371553
Iter 4: ||f(x)|| = 0.006044211728294613
Iter 5: ||f(x)|| = 0.00042941735591739416
Iter 6: ||f(x)|| = 1.4692714103148319e-6
Iter 7: ||f(x)|| = 2.4556356947869062e-11
Solution: [0.236363,354.941]
Residual value: [-1.36523e-11,-2.45564e-11]
Iter 1: ||f(x)|| = 410.0
Iter 2: ||f(x)|| = 4.906043288053297
Iter 3: ||f(x)|| = 0.058705514010398474
Iter 4: ||f(x)|| = 0.0064789513789946795
Iter 5: ||f(x)|| = 0.0004861359666392673
Iter 6: ||f(x)|| = 1.8668333723326214e-6
Iter 7: ||f(x)|| = 3.001332515850663e-11
Solution: [0.247959,354.965]
Residual value: [-2.17165e-11,-3.00133e-11]
Iter 1: ||f(x)|| = 412.0
Iter 2: ||f(x)|| = 4.929975206533527
Iter 3: ||f(x)|| = 0.05899188237344788
Iter 4: ||f(x)|| = 0.006915010550983425
Iter 5: ||f(x)|| = 0.000545701856026426
Iter 6: ||f(x)|| = 2.3322027118410915e-6
Iter 7: ||f(x)|| = 5.002220859751105e-11
Solution: [0.259422,354.99]
Residual value: [-3.33982e-11,-5.00222e-11]
Iter 1: ||f(x)|| = 414.0
Iter 2: ||f(x)|| = 4.953907125012847
Iter 3: ||f(x)|| = 0.059278250738316274
Iter 4: ||f(x)|| = 0.0073523599612599355
Iter 5: ||f(x)|| = 0.0006080192733861622
Iter 6: ||f(x)|| = 2.870590833481401e-6
Iter 7: ||f(x)|| = 7.003109203651547e-11
Solution: [0.270753,355.014]
Residual value: [-4.98701e-11,-7.00311e-11]
Iter 1: ||f(x)|| = 416.0
Iter 2: ||f(x)|| = 4.97783904348762

```

```

Iter 3: ||f(x)|| = 0.05956461909318023
Iter 4: ||f(x)|| = 0.007790970512360218
Iter 5: ||f(x)|| = 0.0006729968181389268
Iter 6: ||f(x)|| = 3.487065441731829e-6
Iter 7: ||f(x)|| = 1.0459189070388675e-10
Solution: [0.281957, 355.038]
Residual value: [-7.25302e-11, -1.04592e-10]
Iter 1: ||f(x)|| = 418.0
Iter 2: ||f(x)|| = 5.001770961972397
Iter 3: ||f(x)|| = 0.05985098745259165
Iter 4: ||f(x)|| = 0.008230813404225046
Iter 5: ||f(x)|| = 0.0007405472197206109
Iter 6: ||f(x)|| = 4.186552359897178e-6
Iter 7: ||f(x)|| = 1.5279510989785194e-10
Solution: [0.293035, 355.062]
Residual value: [-1.03062e-10, -1.52795e-10]
Iter 1: ||f(x)|| = 420.0
Iter 2: ||f(x)|| = 5.02570288044717
Iter 3: ||f(x)|| = 0.060137355812912574
Iter 4: ||f(x)|| = 0.008671860062349879
Iter 5: ||f(x)|| = 0.0008105872402666137
Iter 6: ||f(x)|| = 4.9737664085114375e-6
Iter 7: ||f(x)|| = 2.091837814077735e-10
Solution: [0.30399, 355.087]
Residual value: [-1.43412e-10, -2.09184e-10]
Iter 1: ||f(x)|| = 422.0
Iter 2: ||f(x)|| = 5.049634798931038
Iter 3: ||f(x)|| = 0.06042372418050945
Iter 4: ||f(x)|| = 0.009114082154155767
Iter 5: ||f(x)|| = 0.0008830374108583783
Iter 6: ||f(x)|| = 5.853235961694736e-6
Iter 7: ||f(x)|| = 2.8558133635669947e-10
Solution: [0.314824, 355.111]
Residual value: [-1.95837e-10, -2.85581e-10]
Iter 1: ||f(x)|| = 424.0
Iter 2: ||f(x)|| = 5.073566717405811
Iter 3: ||f(x)|| = 0.06071009254446835
Iter 4: ||f(x)|| = 0.00955745157716592
Iter 5: ||f(x)|| = 0.0009578219205650385
Iter 6: ||f(x)|| = 6.829348421888426e-6
Iter 7: ||f(x)|| = 3.8562575355172157e-10
Solution: [0.325542, 355.135]
Residual value: [-2.62906e-10, -3.85626e-10]
Iter 1: ||f(x)|| = 426.0
Iter 2: ||f(x)|| = 5.097498635886041
Iter 3: ||f(x)|| = 0.06099646090387978
Iter 4: ||f(x)|| = 0.010001940487200045
Iter 5: ||f(x)|| = 0.001034868456372351

```

```

Iter 6: ||f(x)|| = 7.906245627964381e-6
Iter 7: ||f(x)|| = 5.084075382910669e-10
Solution: [0.336143,355.159]
Residual value: [-3.47516e-10,-5.08408e-10]
Iter 1: ||f(x)|| = 428.0
Iter 2: ||f(x)|| = 5.121430554357175
Iter 3: ||f(x)|| = 0.06128282925874373
Iter 4: ||f(x)|| = 0.010447521292917372
Iter 5: ||f(x)|| = 0.0011141080658489955
Iter 6: ||f(x)|| = 9.087916623684578e-6
Iter 7: ||f(x)|| = 6.59383658785373e-10
Solution: [0.346632,355.183]
Residual value: [-4.52904e-10,-6.59384e-10]
Iter 1: ||f(x)|| = 430.0
Iter 2: ||f(x)|| = 5.145362472835586
Iter 3: ||f(x)|| = 0.06156919761906465
Iter 4: ||f(x)|| = 0.010894166617617884
Iter 5: ||f(x)|| = 0.0011954749934375286
Iter 6: ||f(x)|| = 1.037813399307197e-5
Iter 7: ||f(x)|| = 8.540155249647796e-10
Solution: [0.35701,355.208]
Residual value: [-5.82656e-10,-8.54016e-10]
Iter 1: ||f(x)|| = 432.0
Iter 2: ||f(x)|| = 5.169294391319454
Iter 3: ||f(x)|| = 0.06185556598302355
Iter 4: ||f(x)|| = 0.011341849351993005
Iter 5: ||f(x)|| = 0.0012789065731340088
Iter 6: ||f(x)|| = 1.1780514796555508e-5
Iter 7: ||f(x)|| = 1.0941221262328327e-9
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [0.36728,355.232]
Residual value: [8.32667e-17,-9.09495e-13]
Iter 1: ||f(x)|| = 434.0
Iter 2: ||f(x)|| = 5.193226309796046
Iter 3: ||f(x)|| = 0.062141934343344474
Iter 4: ||f(x)|| = 0.011790542604103393
Iter 5: ||f(x)|| = 0.0013643430784213706
Iter 6: ||f(x)|| = 1.3298483281687368e-5
Iter 7: ||f(x)|| = 1.3778844731859863e-9
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.377443,355.256]
Residual value: [-2.85882e-15,2.72848e-12]
Iter 1: ||f(x)|| = 436.0
Iter 2: ||f(x)|| = 5.217158228269909
Iter 3: ||f(x)|| = 0.06242830269820843
Iter 4: ||f(x)|| = 0.012240219731211255
Iter 5: ||f(x)|| = 0.001451727608582587
Iter 6: ||f(x)|| = 1.4935262697690632e-5

```



```

Iter 7: ||f(x)|| = 1.711669028736651e-9
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.387502, 355.28]
Residual value: [1.65146e-15, -2.72848e-12]
Iter 1: ||f(x)|| = 438.0
Iter 2: ||f(x)|| = 5.241090146754686
Iter 3: ||f(x)|| = 0.0627146710658053
Iter 4: ||f(x)|| = 0.012690854357970238
Iter 5: ||f(x)|| = 0.001541006004117662
Iter 6: ||f(x)|| = 1.6693949874024838e-5
Iter 7: ||f(x)|| = 2.1118466975167394e-9
Iter 8: ||f(x)|| = 4.547473508864641e-12
Solution: [0.397459, 355.305]
Residual value: [1.3739e-15, -4.54747e-12]
Iter 1: ||f(x)|| = 440.0
Iter 2: ||f(x)|| = 5.265022065229459
Iter 3: ||f(x)|| = 0.06300103942066926
Iter 4: ||f(x)|| = 0.013142420304575353
Iter 5: ||f(x)|| = 0.001632126688491553
Iter 6: ||f(x)|| = 1.857743973232573e-5
Iter 7: ||f(x)|| = 2.582964953035116e-9
Iter 8: ||f(x)|| = 2.7755575615628914e-16
Solution: [0.407317, 355.329]
Residual value: [-2.77556e-16, 0.0]
Iter 1: ||f(x)|| = 442.0
Iter 2: ||f(x)|| = 5.28895398370878
Iter 3: ||f(x)|| = 0.06328740778462816
Iter 4: ||f(x)|| = 0.013594891654975072
Iter 5: ||f(x)|| = 0.0017250405790036893
Iter 6: ||f(x)|| = 2.0588496226991992e-5
Iter 7: ||f(x)|| = 3.131390258204192e-9
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.417076, 355.353]
Residual value: [5.82867e-16, -2.72848e-12]
Iter 1: ||f(x)|| = 444.0
Iter 2: ||f(x)|| = 5.312885902183552
Iter 3: ||f(x)|| = 0.06357377615040605
Iter 4: ||f(x)|| = 0.01404824273140548
Iter 5: ||f(x)|| = 0.001819701027670817
Iter 6: ||f(x)|| = 2.2729724150849506e-5
Iter 7: ||f(x)|| = 3.776222001761198e-9
Iter 8: ||f(x)|| = 3.637978807091713e-12
Solution: [0.426739, 355.377]
Residual value: [2.40086e-15, -3.63798e-12]
Iter 1: ||f(x)|| = 446.0
Iter 2: ||f(x)|| = 5.336817820662873
Iter 3: ||f(x)|| = 0.06386014450890798
Iter 4: ||f(x)|| = 0.014502448081657349

```

```

Iter 5: ||f(x)|| = 0.0019160636611559312
Iter 6: ||f(x)|| = 2.5003573682624847e-5
Iter 7: ||f(x)|| = 4.5192791731096804e-9
Iter 8: ||f(x)|| = 3.0808688933348094e-15
Solution: [0.436307, 355.401]
Residual value: [3.08087e-15, 0.0]
Iter 1: ||f(x)|| = 448.0
Iter 2: ||f(x)|| = 5.3607497391376455
Iter 3: ||f(x)|| = 0.0641465128701384
Iter 4: ||f(x)|| = 0.014957482510908449
Iter 5: ||f(x)|| = 0.0020140863070992054
Iter 6: ||f(x)|| = 2.7412388590164483e-5
Iter 7: ||f(x)|| = 5.368747224565595e-9
Iter 8: ||f(x)|| = 7.355227538141662e-16
Solution: [0.445784, 355.426]
Residual value: [7.35523e-16, 0.0]
Iter 1: ||f(x)|| = 450.0
Iter 2: ||f(x)|| = 5.384681657622423
Iter 3: ||f(x)|| = 0.06443288122864033
Iter 4: ||f(x)|| = 0.0154133210562577
Iter 5: ||f(x)|| = 0.002113728924996394
Iter 6: ||f(x)|| = 2.995836257468909e-5
Iter 7: ||f(x)|| = 6.341906555462629e-9
Iter 8: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.455169, 355.45]
Residual value: [-1.11022e-16, -1.81899e-12]
Iter 1: ||f(x)|| = 452.0
Iter 2: ||f(x)|| = 5.408613576097196
Iter 3: ||f(x)|| = 0.0647192495980562
Iter 4: ||f(x)|| = 0.015869938963987806
Iter 5: ||f(x)|| = 0.0022149535607240978
Iter 6: ||f(x)|| = 3.264358292653924e-5
Iter 7: ||f(x)|| = 7.442395144607872e-9
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.464466, 355.474]
Residual value: [6.10623e-16, 2.72848e-12]
Iter 1: ||f(x)|| = 454.0
Iter 2: ||f(x)|| = 5.432545494576516
Iter 3: ||f(x)|| = 0.06500561794746318
Iter 4: ||f(x)|| = 0.016327311757777352
Iter 5: ||f(x)|| = 0.0023177241500889068
Iter 6: ||f(x)|| = 3.547001415427076e-5
Iter 7: ||f(x)|| = 8.68749339133501e-9
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [0.473676, 355.498]
Residual value: [-1.7486e-15, 9.09495e-13]
Iter 1: ||f(x)|| = 456.0
Iter 2: ||f(x)|| = 5.456477413056746

```

```

Iter 3: ||f(x)|| = 0.06529198631233157
Iter 4: ||f(x)|| = 0.016785415162303252
Iter 5: ||f(x)|| = 0.0024220065506597166
Iter 6: ||f(x)|| = 3.843953618343221e-5
Iter 7: ||f(x)|| = 1.0096300684381276e-8
Iter 8: ||f(x)|| = 4.440892098500626e-16
Solution: [0.4828,355.523]
Residual value: [4.44089e-16,0.0]
Iter 1: ||f(x)|| = 458.0
Iter 2: ||f(x)|| = 5.4804093315315185
Iter 3: ||f(x)|| = 0.06557835468083795
Iter 4: ||f(x)|| = 0.0172442251632674
Iter 5: ||f(x)|| = 0.0025277684080720064
Iter 6: ||f(x)|| = 4.1553917071723845e-5
Iter 7: ||f(x)|| = 1.1664269550237805e-8
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.491841,355.547]
Residual value: [-8.32667e-16,-2.72848e-12]
Iter 1: ||f(x)|| = 460.0
Iter 2: ||f(x)|| = 5.504341250011748
Iter 3: ||f(x)|| = 0.0658647230366114
Iter 4: ||f(x)|| = 0.017703717967378907
Iter 5: ||f(x)|| = 0.002634979116010072
Iter 6: ||f(x)|| = 4.4814856664743274e-5
Iter 7: ||f(x)|| = 1.3421413314063102e-8
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.500799,355.571]
Residual value: [1.66533e-16,2.72848e-12]
Iter 1: ||f(x)|| = 462.0
Iter 2: ||f(x)|| = 5.528273168491069
Iter 3: ||f(x)|| = 0.06615109139511333
Iter 4: ||f(x)|| = 0.018163869985983183
Iter 5: ||f(x)|| = 0.002743609736171493
Iter 6: ||f(x)|| = 4.8223943849734496e-5
Iter 7: ||f(x)|| = 1.5370460459962487e-8
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [0.509676,355.595]
Residual value: [-2.77556e-17,9.09495e-13]
Iter 1: ||f(x)|| = 464.0
Iter 2: ||f(x)|| = 5.5522050869658415
Iter 3: ||f(x)|| = 0.06643745975543425
Iter 4: ||f(x)|| = 0.01862465792328294
Iter 5: ||f(x)|| = 0.0028536329273265437
Iter 6: ||f(x)|| = 5.178273386263754e-5
Iter 7: ||f(x)|| = 1.753596734488383e-8
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [0.518474,355.619]
Residual value: [1.88738e-15,-9.09495e-13]

```

```

Iter 1: ||f(x)|| = 466.0
Iter 2: ||f(x)|| = 5.576137005445162
Iter 3: ||f(x)|| = 0.06672382811939315
Iter 4: ||f(x)|| = 0.019086058669927297
Iter 5: ||f(x)|| = 0.002965022885291546
Iter 6: ||f(x)|| = 5.5492679166491143e-5
Iter 7: ||f(x)|| = 1.992430043173954e-8
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [0.527195, 355.644]
Residual value: [1.80411e-15, -9.09495e-13]
Iter 1: ||f(x)|| = 468.0
Iter 2: ||f(x)|| = 5.600068923924482
Iter 3: ||f(x)|| = 0.067010196492447
Iter 4: ||f(x)|| = 0.019548049366676423
Iter 5: ||f(x)|| = 0.0030777553211009945
Iter 6: ||f(x)|| = 5.9355214034439996e-5
Iter 7: ||f(x)|| = 2.2550011635757983e-8
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.535839, 355.668]
Residual value: [3.88578e-16, -2.72848e-12]
Iter 1: ||f(x)|| = 470.0
Iter 2: ||f(x)|| = 5.624000842404712
Iter 3: ||f(x)|| = 0.06729656484367297
Iter 4: ||f(x)|| = 0.02001060734892235
Iter 5: ||f(x)|| = 0.0031918073300403194
Iter 6: ||f(x)|| = 6.337168360914802e-5
Iter 7: ||f(x)|| = 2.5443114282097667e-8
Iter 8: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.544408, 355.692]
Residual value: [1.13798e-15, 1.81899e-12]
Iter 1: ||f(x)|| = 472.0
Iter 2: ||f(x)|| = 5.647932760878575
Iter 3: ||f(x)|| = 0.06758293320854136
Iter 4: ||f(x)|| = 0.020473710227634
Iter 5: ||f(x)|| = 0.0033071573825509404
Iter 6: ||f(x)|| = 6.754339392500697e-5
Iter 7: ||f(x)|| = 2.860269887605682e-8
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [0.552904, 355.716]
Residual value: [-2.498e-16, -9.09495e-13]
Iter 1: ||f(x)|| = 474.0
Iter 2: ||f(x)|| = 5.671864679358805
Iter 3: ||f(x)|| = 0.06786930155703885
Iter 4: ||f(x)|| = 0.02093733582569257
Iter 5: ||f(x)|| = 0.003423785264203616
Iter 6: ||f(x)|| = 7.187163009803044e-5
Iter 7: ||f(x)|| = 3.205332177458331e-8
Iter 8: ||f(x)|| = 9.094947017729282e-13

```

```

Solution: [0.561328,355.741]
Residual value: [1.72085e-15,-9.09495e-13]
Iter 1: ||f(x)|| = 476.0
Iter 2: ||f(x)|| = 5.695796597838125
Iter 3: ||f(x)|| = 0.06815566992554523
Iter 4: ||f(x)|| = 0.02140146218425798
Iter 5: ||f(x)|| = 0.003541672052051581
Iter 6: ||f(x)|| = 7.635762722202344e-5
Iter 7: ||f(x)|| = 3.581499186111614e-8
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.569681,355.765]
Residual value: [1.88738e-15,2.72848e-12]
Iter 1: ||f(x)|| = 478.0
Iter 2: ||f(x)|| = 5.719728516317446
Iter 3: ||f(x)|| = 0.06844203829132312
Iter 4: ||f(x)|| = 0.021866067559130897
Iter 5: ||f(x)|| = 0.0036607999945772463
Iter 6: ||f(x)|| = 8.100259492493933e-5
Iter 7: ||f(x)|| = 3.989862307207659e-8
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.577964,355.789]
Residual value: [2.55351e-15,-2.72848e-12]
Iter 1: ||f(x)|| = 480.0
Iter 2: ||f(x)|| = 5.743660434794037
Iter 3: ||f(x)|| = 0.06872840663527313
Iter 4: ||f(x)|| = 0.02233113046440849
Iter 5: ||f(x)|| = 0.0037811525298820925
Iter 6: ||f(x)|| = 8.580773283028975e-5
Iter 7: ||f(x)|| = 4.4320586312096566e-8
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [0.586179,355.813]
Residual value: [6.32827e-15,9.09495e-13]
Iter 1: ||f(x)|| = 482.0
Iter 2: ||f(x)|| = 5.767592353273358
Iter 3: ||f(x)|| = 0.069014775004689
Iter 4: ||f(x)|| = 0.0227966296060913
Iter 5: ||f(x)|| = 0.003902714216565073
Iter 6: ||f(x)|| = 9.077420781977708e-5
Iter 7: ||f(x)|| = 4.9109985411632806e-8
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [0.594328,355.837]
Residual value: [4.46865e-15,-9.09495e-13]
Iter 1: ||f(x)|| = 484.0
Iter 2: ||f(x)|| = 5.791524271748131
Iter 3: ||f(x)|| = 0.06930114337046689
Iter 4: ||f(x)|| = 0.02326254393756244
Iter 5: ||f(x)|| = 0.00402547068279091
Iter 6: ||f(x)|| = 9.590317495167255e-5

```

```

Iter 7: ||f(x)|| = 5.4284100770018995e-8
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [0.60241, 355.862]
Residual value: [5.80092e-15, -9.09495e-13]
Iter 1: ||f(x)|| = 486.0
Iter 2: ||f(x)|| = 5.815456190227451
Iter 3: ||f(x)|| = 0.06958751172987832
Iter 4: ||f(x)|| = 0.023728852615022333
Iter 5: ||f(x)|| = 0.004149408619014139
Iter 6: ||f(x)|| = 0.00010119579292222625
Iter 7: ||f(x)|| = 5.984202289255336e-8
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.610428, 355.886]
Residual value: [8.71525e-15, 2.72848e-12]
Iter 1: ||f(x)|| = 488.0
Iter 2: ||f(x)|| = 5.839388108712228
Iter 3: ||f(x)|| = 0.06987388009201823
Iter 4: ||f(x)|| = 0.024195535041144467
Iter 5: ||f(x)|| = 0.004274515678844182
Iter 6: ||f(x)|| = 0.00010665321042324649
Iter 7: ||f(x)|| = 6.583195499842986e-8
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [0.618382, 355.91]
Residual value: [9.74221e-15, 9.09495e-13]
Iter 1: ||f(x)|| = 490.0
Iter 2: ||f(x)|| = 5.863320027181544
Iter 3: ||f(x)|| = 0.07016024844870117
Iter 4: ||f(x)|| = 0.024662570810505713
Iter 5: ||f(x)|| = 0.004400780482683331
Iter 6: ||f(x)|| = 0.00011227658160350984
Iter 7: ||f(x)|| = 7.225480658235028e-8
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [0.626274, 355.934]
Residual value: [9.32587e-15, -9.09495e-13]
Iter 1: ||f(x)|| = 492.0
Iter 2: ||f(x)|| = 5.887251945661774
Iter 3: ||f(x)|| = 0.07044661681720754
Iter 4: ||f(x)|| = 0.02512993973959965
Iter 5: ||f(x)|| = 0.004528192562247568
Iter 6: ||f(x)|| = 0.0001180670415124041
Iter 7: ||f(x)|| = 7.914513844298199e-8
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.634105, 355.959]
Residual value: [1.14908e-14, 2.72848e-12]
Iter 1: ||f(x)|| = 494.0
Iter 2: ||f(x)|| = 5.911183864141094
Iter 3: ||f(x)|| = 0.0707329851720715
Iter 4: ||f(x)|| = 0.025597621880478982

```

```

Iter 5: ||f(x)|| = 0.0046567423623855575
Iter 6: ||f(x)|| = 0.00012402578704495681
Iter 7: ||f(x)|| = 8.65056790644303e-8
Iter 8: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.641876, 355.983]
Residual value: [1.44607e-14, -1.81899e-12]
Iter 1: ||f(x)|| = 496.0
Iter 2: ||f(x)|| = 5.935115782625871
Iter 3: ||f(x)|| = 0.07101935353148292
Iter 4: ||f(x)|| = 0.026065597491651715
Iter 5: ||f(x)|| = 0.0047864211182968575
Iter 6: ||f(x)|| = 0.00013015398053539684
Iter 7: ||f(x)|| = 9.437280823476613e-8
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [0.649588, 356.007]
Residual value: [1.65701e-14, 9.09495e-13]
Iter 1: ||f(x)|| = 498.0
Iter 2: ||f(x)|| = 5.959047701099735
Iter 3: ||f(x)|| = 0.0713057218990798
Iter 4: ||f(x)|| = 0.02653384703808115
Iter 5: ||f(x)|| = 0.004917220931929478
Iter 6: ||f(x)|| = 0.0001364528134217835
Iter 7: ||f(x)|| = 1.0276107786921784e-7
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [0.657242, 356.031]
Residual value: [2.05391e-14, -9.09495e-13]
Iter 1: ||f(x)|| = 500.0
Iter 2: ||f(x)|| = 5.9829796195799645
Iter 3: ||f(x)|| = 0.07159209026031021
Iter 4: ||f(x)|| = 0.02700235124120809
Iter 5: ||f(x)|| = 0.0050491346746639465
Iter 6: ||f(x)|| = 0.0001429235198884271
Iter 7: ||f(x)|| = 1.1170413927175105e-7
Iter 8: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.664839, 356.055]
Residual value: [2.42861e-14, -1.81899e-12]
Iter 1: ||f(x)|| = 502.0
Iter 2: ||f(x)|| = 6.006911538059285
Iter 3: ||f(x)|| = 0.07187845861972164
Iter 4: ||f(x)|| = 0.027471090958897548
Iter 5: ||f(x)|| = 0.005182155949114531
Iter 6: ||f(x)|| = 0.0001495673031968181
Iter 7: ||f(x)|| = 1.2121927284169942e-7
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.67238, 356.08]
Residual value: [2.75335e-14, -2.72848e-12]
Iter 1: ||f(x)|| = 504.0
Iter 2: ||f(x)|| = 6.030843456534967

```

```

Iter 3: ||f(x)|| = 0.07216482698368054
Iter 4: ||f(x)|| = 0.02794004735278577
Iter 5: ||f(x)|| = 0.005316279072758334
Iter 6: ||f(x)|| = 0.0001563854575579171
Iter 7: ||f(x)|| = 1.3132103049429134e-7
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [0.679866, 356.104]
Residual value: [-6.02018e-14, 9.09495e-13]
Iter 1: ||f(x)|| = 506.0
Iter 2: ||f(x)|| = 6.054775375015197
Iter 3: ||f(x)|| = 0.072451195337635
Iter 4: ||f(x)|| = 0.028409201716385724
Iter 5: ||f(x)|| = 0.005451499088849232
Iter 6: ||f(x)|| = 0.00016337926535925362
Iter 7: ||f(x)|| = 1.4204215403879061e-7
Iter 8: ||f(x)|| = 6.855627177060342e-14
Solution: [0.687298, 356.128]
Residual value: [-6.85563e-14, 0.0]
Iter 1: ||f(x)|| = 508.0
Iter 2: ||f(x)|| = 6.078707293494517
Iter 3: ||f(x)|| = 0.07273756369795592
Iter 4: ||f(x)|| = 0.028878535596049915
Iter 5: ||f(x)|| = 0.005587811649093055
Iter 6: ||f(x)|| = 0.00017055004900612403
Iter 7: ||f(x)|| = 1.5340719983214512e-7
Iter 8: ||f(x)|| = 3.637978807091713e-12
Solution: [0.694677, 356.152]
Residual value: [-7.89646e-14, 3.63798e-12]
Iter 1: ||f(x)|| = 510.0
Iter 2: ||f(x)|| = 6.102639211963833
Iter 3: ||f(x)|| = 0.07302393205736735
Iter 4: ||f(x)|| = 0.02934803075459058
Iter 5: ||f(x)|| = 0.005725213101868576
Iter 6: ||f(x)|| = 0.0001778991827450227
Iter 7: ||f(x)|| = 1.6543253877898678e-7
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.702004, 356.177]
Residual value: [-9.31755e-14, 2.72848e-12]
Iter 1: ||f(x)|| = 512.0
Iter 2: ||f(x)|| = 6.126571130454067
Iter 3: ||f(x)|| = 0.07331030042678321
Iter 4: ||f(x)|| = 0.02981766912580497
Iter 5: ||f(x)|| = 0.0058637003539843136
Iter 6: ||f(x)|| = 0.00018542804082244402
Iter 7: ||f(x)|| = 1.7815273167798296e-7
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.709279, 356.201]
Residual value: [-1.07886e-13, -2.72848e-12]

```



```

Iter 1: ||f(x)|| = 514.0
Iter 2: ||f(x)|| = 6.150503048927931
Iter 3: ||f(x)|| = 0.07359666879165161
Iter 4: ||f(x)|| = 0.03028743288177793
Iter 5: ||f(x)|| = 0.006003270923429227
Iter 6: ||f(x)|| = 0.000193138074791932
Iter 7: ||f(x)|| = 1.9159233488608152e-7
Iter 8: ||f(x)|| = 1.2378986724570495e-13
Solution: [0.716504, 356.225]
Residual value: [-1.2379e-13, 0.0]
Iter 1: ||f(x)|| = 516.0
Iter 2: ||f(x)|| = 6.1744349674027035
Iter 3: ||f(x)|| = 0.07388303715106304
Iter 4: ||f(x)|| = 0.03075730439650215
Iter 5: ||f(x)|| = 0.006143922856608697
Iter 6: ||f(x)|| = 0.000201030735297536
Iter 7: ||f(x)|| = 2.0578227122314274e-7
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [0.72368, 356.249]
Residual value: [-1.38139e-13, -9.09495e-13]
Iter 1: ||f(x)|| = 518.0
Iter 2: ||f(x)|| = 6.198366885887481
Iter 3: ||f(x)|| = 0.07416940551502194
Iter 4: ||f(x)|| = 0.031227266225869243
Iter 5: ||f(x)|| = 0.00628565476017684
Iter 6: ||f(x)|| = 0.00020910757393721724
Iter 7: ||f(x)|| = 2.2074618755141273e-7
Iter 8: ||f(x)|| = 7.275957614183426e-12
Solution: [0.730807, 356.273]
Residual value: [-1.61121e-13, 7.27596e-12]
Iter 1: ||f(x)|| = 520.0
Iter 2: ||f(x)|| = 6.222298804362254
Iter 3: ||f(x)|| = 0.07445577386442892
Iter 4: ||f(x)|| = 0.0316973011376831
Iter 5: ||f(x)|| = 0.006428465755561774
Iter 6: ||f(x)|| = 0.0002173701323044952
Iter 7: ||f(x)|| = 2.365031832596287e-7
Iter 8: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.737887, 356.298]
Residual value: [-1.82854e-13, 1.81899e-12]
Iter 1: ||f(x)|| = 522.0
Iter 2: ||f(x)|| = 6.246230722841574
Iter 3: ||f(x)|| = 0.07474214222929731
Iter 4: ||f(x)|| = 0.0321673921398542
Iter 5: ||f(x)|| = 0.006572355413482001
Iter 6: ||f(x)|| = 0.00022582001838600263
Iter 7: ||f(x)|| = 2.531105565140024e-7
Iter 8: ||f(x)|| = 9.094947017729282e-13

```

Solution: [0.744919, 356.322]
 Residual value: [-2.07806e-13, -9.09495e-13]
 Iter 1: ||f(x)|| = 524.0
 Iter 2: ||f(x)|| = 6.270162641316347
 Iter 3: ||f(x)|| = 0.07502851058961824
 Iter 4: ||f(x)|| = 0.03263752236034634
 Iter 5: ||f(x)|| = 0.006717323819430021
 Iter 6: ||f(x)|| = 0.0002344589092899696
 Iter 7: ||f(x)|| = 2.705628503463231e-7
 Iter 8: ||f(x)|| = 2.7284841053187847e-12
 Solution: [0.751905, 356.346]
 Residual value: [-2.32175e-13, 2.72848e-12]
 Iter 1: ||f(x)|| = 526.0
 Iter 2: ||f(x)|| = 6.294094559795667
 Iter 3: ||f(x)|| = 0.07531487895812461
 Iter 4: ||f(x)|| = 0.03310767523271352
 Iter 5: ||f(x)|| = 0.0068633714681709534
 Iter 6: ||f(x)|| = 0.0002432884939480573
 Iter 7: ||f(x)|| = 2.889100869651884e-7
 Iter 8: ||f(x)|| = 2.7284841053187847e-12
 Solution: [0.758846, 356.37]
 Residual value: [-2.63789e-13, -2.72848e-12]
 Iter 1: ||f(x)|| = 528.0
 Iter 2: ||f(x)|| = 6.318026478275897
 Iter 3: ||f(x)|| = 0.07560124730844109
 Iter 4: ||f(x)|| = 0.03357783429964911
 Iter 5: ||f(x)|| = 0.007010499317402719
 Iter 6: ||f(x)|| = 0.0002523105440559448
 Iter 7: ||f(x)|| = 3.081895556533709e-7
 Iter 8: ||f(x)|| = 1.8189894035458565e-12
 Solution: [0.765742, 356.395]
 Residual value: [-3.01065e-13, 1.81899e-12]
 Iter 1: ||f(x)|| = 530.0
 Iter 2: ||f(x)|| = 6.341958396755217
 Iter 3: ||f(x)|| = 0.07588761567239999
 Iter 4: ||f(x)|| = 0.034047983336677135
 Iter 5: ||f(x)|| = 0.00715870871408697
 Iter 6: ||f(x)|| = 0.00026152686132263625
 Iter 7: ||f(x)|| = 3.2841944630490616e-7
 Iter 8: ||f(x)|| = 6.366462912410498e-12
 Solution: [0.772594, 356.419]
 Residual value: [-3.33844e-13, -6.36646e-12]
 Iter 1: ||f(x)|| = 532.0
 Iter 2: ||f(x)|| = 6.365890315230899
 Iter 3: ||f(x)|| = 0.07617398403181141
 Iter 4: ||f(x)|| = 0.03451810631577246
 Iter 5: ||f(x)|| = 0.0073080013562503154
 Iter 6: ||f(x)|| = 0.0002709393238546909

```

Iter 7: ||f(x)|| = 3.496306817396544e-7
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.779404, 356.443]
Residual value: [-3.76144e-13, 2.72848e-12]
Iter 1: ||f(x)|| = 534.0
Iter 2: ||f(x)|| = 6.38982223371022
Iter 3: ||f(x)|| = 0.07646035240031779
Iter 4: ||f(x)|| = 0.034988187399903836
Iter 5: ||f(x)|| = 0.007458379371200863
Iter 6: ||f(x)|| = 0.00028054986159986584
Iter 7: ||f(x)|| = 3.7186873669270426e-7
Iter 8: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.786171, 356.467]
Residual value: [-4.20941e-13, -1.81899e-12]
Iter 1: ||f(x)|| = 536.0
Iter 2: ||f(x)|| = 6.413754152184993
Iter 3: ||f(x)|| = 0.07674672075154376
Iter 4: ||f(x)|| = 0.035458210934848466
Iter 5: ||f(x)|| = 0.00760984520366037
Iter 6: ||f(x)|| = 0.00029036043815722223
Iter 7: ||f(x)|| = 3.9516089600510895e-7
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.792896, 356.491]
Residual value: [-4.70374e-13, -2.72848e-12]
Iter 1: ||f(x)|| = 538.0
Iter 2: ||f(x)|| = 6.437686070664313
Iter 3: ||f(x)|| = 0.07703308912005014
Iter 4: ||f(x)|| = 0.03592816148102429
Iter 5: ||f(x)|| = 0.0077624016576010035
Iter 6: ||f(x)|| = 0.00030037308715691324
Iter 7: ||f(x)|| = 4.1954535845434293e-7
Iter 8: ||f(x)|| = 5.253297796770084e-13
Solution: [0.79958, 356.516]
Residual value: [-5.2533e-13, 0.0]
Iter 1: ||f(x)|| = 540.0
Iter 2: ||f(x)|| = 6.461617989144543
Iter 3: ||f(x)|| = 0.0773194574740046
Iter 4: ||f(x)|| = 0.03639802377347223
Iter 5: ||f(x)|| = 0.007916051813481317
Iter 6: ||f(x)|| = 0.0003105899222646258
Iter 7: ||f(x)|| = 4.450657797860913e-7
Iter 8: ||f(x)|| = 3.637978807091713e-12
Solution: [0.806224, 356.54]
Residual value: [-5.87724e-13, 3.63798e-12]
Iter 1: ||f(x)|| = 542.0
Iter 2: ||f(x)|| = 6.485549907623863
Iter 3: ||f(x)|| = 0.07760582584342046
Iter 4: ||f(x)|| = 0.036867782741865085

```

```

Iter 5: ||f(x)|| = 0.008070799095548864
Iter 6: ||f(x)|| = 0.00032101310080179246
Iter 7: ||f(x)|| = 4.7174853534670547e-7
Iter 8: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.812829, 356.564]
Residual value: [-6.55975e-13, -1.81899e-12]
Iter 1: ||f(x)|| = 544.0
Iter 2: ||f(x)|| = 6.509481826098636
Iter 3: ||f(x)|| = 0.07789332882475719
Iter 4: ||f(x)|| = 0.03733765290417068
Iter 5: ||f(x)|| = 0.008226779723372601
Iter 6: ||f(x)|| = 0.00033165559307235526
Iter 7: ||f(x)|| = 4.996727511752397e-7
Iter 8: ||f(x)|| = 1.8189894035458565e-12
Solution: [0.819394, 356.588]
Residual value: [-7.30277e-13, 1.81899e-12]
Iter 1: ||f(x)|| = 546.0
Iter 2: ||f(x)|| = 6.533413744577956
Iter 3: ||f(x)|| = 0.0788079460580775
Iter 4: ||f(x)|| = 0.03793476077862579
Iter 5: ||f(x)|| = 0.008458024932224362
Iter 6: ||f(x)|| = 0.0003486384212010307
Iter 7: ||f(x)|| = 5.481015250552446e-7
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [0.825922, 356.613]
Residual value: [-8.7147e-13, 9.09495e-13]
Iter 1: ||f(x)|| = 548.0
Iter 2: ||f(x)|| = 6.557345663058186
Iter 3: ||f(x)|| = 0.07972261797112878
Iter 4: ||f(x)|| = 0.03853287000765704
Iter 5: ||f(x)|| = 0.008692183385392127
Iter 6: ||f(x)|| = 0.0003662175640783971
Iter 7: ||f(x)|| = 6.003565431456082e-7
Iter 8: ||f(x)|| = 3.637978807091713e-12
Solution: [0.832412, 356.637]
Residual value: [-1.03431e-12, 3.63798e-12]
Iter 1: ||f(x)|| = 550.0
Iter 2: ||f(x)|| = 6.581277581542054
Iter 3: ||f(x)|| = 0.08063733867038536
Iter 4: ||f(x)|| = 0.03913194061624381
Iter 5: ||f(x)|| = 0.008929232669288467
Iter 6: ||f(x)|| = 0.00038440390744653996
Iter 7: ||f(x)|| = 6.566715455846861e-7
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [0.838864, 356.661]
Residual value: [-1.23151e-12, 2.72848e-12]
Iter 1: ||f(x)|| = 552.0
Iter 2: ||f(x)|| = 6.6052095000131885

```

```

Iter 3: ||f(x)|| = 0.08155210223503673
Iter 4: ||f(x)|| = 0.039731933643452066
Iter 5: ||f(x)|| = 0.009169150230263767
Iter 6: ||f(x)|| = 0.00040320832067664014
Iter 7: ||f(x)|| = 7.172957339207642e-7
Iter 8: ||f(x)|| = 8.185452315956354e-12
Solution: [0.845281, 356.685]
Residual value: [-1.45445e-12, -8.18545e-12]
Iter 1: ||f(x)|| = 554.0
Iter 2: ||f(x)|| = 6.629141418487961
Iter 3: ||f(x)|| = 0.08246690272881096
Iter 4: ||f(x)|| = 0.04033281112333498
Iter 5: ||f(x)|| = 0.009411913426447427
Iter 6: ||f(x)|| = 0.00042264167859684676
Iter 7: ||f(x)|| = 7.824764907127246e-7
Iter 8: ||f(x)|| = 1.714239861172473e-12
Solution: [0.851662, 356.709]
Residual value: [-1.71424e-12, 9.09495e-13]
Iter 1: ||f(x)|| = 556.0
Iter 2: ||f(x)|| = 6.653073336967282
Iter 3: ||f(x)|| = 0.08338173422271211
Iter 4: ||f(x)|| = 0.04093453604309616
Iter 5: ||f(x)|| = 0.009657499530476343
Iter 6: ||f(x)|| = 0.0004427148414833937
Iter 7: ||f(x)|| = 8.524866643710993e-7
Iter 8: ||f(x)|| = 2.016942168836522e-12
Solution: [0.858007, 356.734]
Residual value: [-2.01694e-12, 0.0]
Iter 1: ||f(x)|| = 558.0
Iter 2: ||f(x)|| = 6.677005255446602
Iter 3: ||f(x)|| = 0.08429659074499796
Iter 4: ||f(x)|| = 0.041537072343089676
Iter 5: ||f(x)|| = 0.009905885711305018
Iter 6: ||f(x)|| = 0.0004634386341422214
Iter 7: ||f(x)|| = 9.275900083594024e-7
Iter 8: ||f(x)|| = 2.373323759741197e-12
Solution: [0.864318, 356.758]
Residual value: [-2.37332e-12, -9.09495e-13]
Iter 1: ||f(x)|| = 560.0
Iter 2: ||f(x)|| = 6.700937173926832
Iter 3: ||f(x)|| = 0.08521146635848709
Iter 4: ||f(x)|| = 0.0421403848549744
Iter 5: ||f(x)|| = 0.01015704909877968
Iter 6: ||f(x)|| = 0.00048482392321602674
Iter 7: ||f(x)|| = 1.0080811989610083e-6
Iter 8: ||f(x)|| = 7.275957614183426e-12
Solution: [0.870596, 356.782]
Residual value: [-2.7795e-12, -7.27596e-12]

```

```

Iter 1: ||f(x)|| = 562.0
Iter 2: ||f(x)|| = 6.724869092406152
Iter 3: ||f(x)|| = 0.08612635505869548
Iter 4: ||f(x)|| = 0.04274443928079563
Iter 5: ||f(x)|| = 0.010410966739073046
Iter 6: ||f(x)|| = 0.0005068815435151919
Iter 7: ||f(x)|| = 1.094261278922204e-6
Iter 8: ||f(x)|| = 4.547473508864641e-12
Solution: [0.876839, 356.806]
Residual value: [-3.2517e-12, -4.54747e-12]
Iter 1: ||f(x)|| = 564.0
Iter 2: ||f(x)|| = 6.748801010885472
Iter 3: ||f(x)|| = 0.08704125088570436
Iter 4: ||f(x)|| = 0.04334920216297178
Iter 5: ||f(x)|| = 0.010667615634702088
Iter 6: ||f(x)|| = 0.0005296223016557633
Iter 7: ||f(x)|| = 1.1864294719998725e-6
Iter 8: ||f(x)|| = 1.000444171950221e-11
Solution: [0.88305, 356.831]
Residual value: [-3.79255e-12, -1.00044e-11]
Iter 1: ||f(x)|| = 566.0
Iter 2: ||f(x)|| = 6.772732929360245
Iter 3: ||f(x)|| = 0.08795614784230565
Iter 4: ||f(x)|| = 0.04395464089975576
Iter 5: ||f(x)|| = 0.010926972772722365
Iter 6: ||f(x)|| = 0.0005530570333576179
Iter 7: ||f(x)|| = 1.284902282350231e-6
Iter 8: ||f(x)|| = 1.000444171950221e-11
Solution: [0.889229, 356.855]
Residual value: [-4.40714e-12, -1.00044e-11]
Iter 1: ||f(x)|| = 568.0
Iter 2: ||f(x)|| = 6.796664847840475
Iter 3: ||f(x)|| = 0.08887103989400202
Iter 4: ||f(x)|| = 0.04456072365246655
Iter 5: ||f(x)|| = 0.0111890150783438
Iter 6: ||f(x)|| = 0.0005771965434178128
Iter 7: ||f(x)|| = 1.3900207704864442e-6
Iter 8: ||f(x)|| = 6.366462912410498e-12
Solution: [0.895376, 356.879]
Residual value: [-5.12401e-12, -6.36646e-12]
Iter 1: ||f(x)|| = 570.0
Iter 2: ||f(x)|| = 6.820596766319795
Iter 3: ||f(x)|| = 0.08978592105540883
Iter 4: ||f(x)|| = 0.04516741938004998
Iter 5: ||f(x)|| = 0.011453719461314904
Iter 6: ||f(x)|| = 0.0006020516393618891
Iter 7: ||f(x)|| = 1.502134182373993e-6
Iter 8: ||f(x)|| = 8.185452315956354e-12

```

Solution: [0.901492, 356.903]
 Residual value: [-5.93336e-12, -8.18545e-12]
 Iter 1: ||f(x)|| = 572.0
 Iter 2: ||f(x)|| = 6.844528684794568
 Iter 3: ||f(x)|| = 0.09070078528839076
 Iter 4: ||f(x)|| = 0.04577469777177612
 Iter 5: ||f(x)|| = 0.011721062820470252
 Iter 6: ||f(x)|| = 0.0006276331141634728
 Iter 7: ||f(x)|| = 1.6215954019571654e-6
 Iter 8: ||f(x)|| = 9.094947017729282e-12
 Solution: [0.907577, 356.927]
 Residual value: [-6.86134e-12, -9.09495e-12]
 Iter 1: ||f(x)|| = 574.0
 Iter 2: ||f(x)|| = 6.868460603273888
 Iter 3: ||f(x)|| = 0.09161562655481248
 Iter 4: ||f(x)|| = 0.04638252926088171
 Iter 5: ||f(x)|| = 0.011991022039183008
 Iter 6: ||f(x)|| = 0.0006539517244164017
 Iter 7: ||f(x)|| = 1.7487682271166705e-6
 Iter 8: ||f(x)|| = 1.0913936421275139e-11
 Solution: [0.913631, 356.952]
 Residual value: [-7.91925e-12, -1.09139e-11]
 Iter 1: ||f(x)|| = 576.0
 Iter 2: ||f(x)|| = 6.892392521758666
 Iter 3: ||f(x)|| = 0.09253043881199119
 Iter 4: ||f(x)|| = 0.04699088499091886
 Iter 5: ||f(x)|| = 0.012263574017197243
 Iter 6: ||f(x)|| = 0.0006810182985645952
 Iter 7: ||f(x)|| = 1.8840437405742705e-6
 Iter 8: ||f(x)|| = 1.6370904631912708e-11
 Solution: [0.919657, 356.976]
 Residual value: [-9.12592e-12, -1.63709e-11]
 Iter 1: ||f(x)|| = 578.0
 Iter 2: ||f(x)|| = 6.9163244402334385
 Iter 3: ||f(x)|| = 0.09344521598450228
 Iter 4: ||f(x)|| = 0.047599736765732814
 Iter 5: ||f(x)|| = 0.0125386956588045
 Iter 6: ||f(x)|| = 0.0007088435877449228
 Iter 7: ||f(x)|| = 2.0278102965676226e-6
 Iter 8: ||f(x)|| = 2.091837814077735e-11
 Solution: [0.925653, 357.0]
 Residual value: [-1.04944e-11, -2.09184e-11]
 Iter 1: ||f(x)|| = 580.0
 Iter 2: ||f(x)|| = 6.940256358708211
 Iter 3: ||f(x)|| = 0.094359952024206
 Iter 4: ||f(x)|| = 0.04820905708857026
 Iter 5: ||f(x)|| = 0.012816363850106427
 Iter 6: ||f(x)|| = 0.0007374383285423391

```

Iter 7: ||f(x)|| = 2.1804935386171564e-6
Iter 8: ||f(x)|| = 1.9099388737231493e-11
Solution: [0.93162, 357.024]
Residual value: [-1.20419e-11, -1.90994e-11]
Iter 1: ||f(x)|| = 582.0
Iter 2: ||f(x)|| = 6.964188277187532
Iter 3: ||f(x)|| = 0.09527464085476822
Iter 4: ||f(x)|| = 0.04881881910478114
Iter 5: ||f(x)|| = 0.013096555533593346
Iter 6: ||f(x)|| = 0.0007668133166589541
Iter 7: ||f(x)|| = 2.342493644391652e-6
Iter 8: ||f(x)|| = 2.000888343900442e-11
Solution: [0.937559, 357.049]
Residual value: [-1.38035e-11, -2.00089e-11]
Iter 1: ||f(x)|| = 584.0
Iter 2: ||f(x)|| = 6.988120195667761
Iter 3: ||f(x)|| = 0.09618927637257002
Iter 4: ||f(x)|| = 0.04942899656998634
Iter 5: ||f(x)|| = 0.013379247662669513
Iter 6: ||f(x)|| = 0.0007969792914082063
Iter 7: ||f(x)|| = 2.514270818210207e-6
Iter 8: ||f(x)|| = 2.546585164964199e-11
Solution: [0.943471, 357.073]
Residual value: [-1.57817e-11, -2.54659e-11]
Iter 1: ||f(x)|| = 586.0
Iter 2: ||f(x)|| = 7.012052114147082
Iter 3: ||f(x)|| = 0.0971038524985488
Iter 4: ||f(x)|| = 0.05003956385917263
Iter 5: ||f(x)|| = 0.013664417219843017
Iter 6: ||f(x)|| = 0.0008279469902845449
Iter 7: ||f(x)|| = 2.6962698029819876e-6
Iter 8: ||f(x)|| = 2.7284841053187847e-11
Solution: [0.949355, 357.097]
Residual value: [-1.80197e-11, -2.72848e-11]
Iter 1: ||f(x)|| = 588.0
Iter 2: ||f(x)|| = 7.035984032626402
Iter 3: ||f(x)|| = 0.09801836311271472
Iter 4: ||f(x)|| = 0.05065049594395532
Iter 5: ||f(x)|| = 0.013952041221273248
Iter 6: ||f(x)|| = 0.0008597271389589878
Iter 7: ||f(x)|| = 2.8889571694890037e-6
Iter 8: ||f(x)|| = 3.728928277269006e-11
Solution: [0.955212, 357.121]
Residual value: [-2.05354e-11, -3.72893e-11]
Iter 1: ||f(x)|| = 590.0
Iter 2: ||f(x)|| = 7.059915951101175
Iter 3: ||f(x)|| = 0.09893280211963429
Iter 4: ||f(x)|| = 0.051261768387121265

```



```

Iter 5: ||f(x)|| = 0.014242096728594333
Iter 6: ||f(x)|| = 0.0008923304949348676
Iter 7: ||f(x)|| = 3.092810402449686e-6
Iter 8: ||f(x)|| = 3.9108272176235914e-11
Solution: [0.961043, 357.145]
Residual value: [-2.33724e-11, -3.91083e-11]
Iter 1: ||f(x)|| = 592.0
Iter 2: ||f(x)|| = 7.083847869581405
Iter 3: ||f(x)|| = 0.09984716338476574
Iter 4: ||f(x)|| = 0.05187335727896425
Iter 5: ||f(x)|| = 0.014534560838910693
Iter 6: ||f(x)|| = 0.0009257677629648242
Iter 7: ||f(x)|| = 3.3083460948546417e-6
Iter 8: ||f(x)|| = 4.3655745685100555e-11
Solution: [0.966849, 357.17]
Residual value: [-2.65522e-11, -4.36557e-11]
Iter 1: ||f(x)|| = 594.0
Iter 2: ||f(x)|| = 7.107779788060725
Iter 3: ||f(x)|| = 0.10076144077902427
Iter 4: ||f(x)|| = 0.05248523927821225
Iter 5: ||f(x)|| = 0.014829410714810365
Iter 6: ||f(x)|| = 0.0009600496669008862
Iter 7: ||f(x)|| = 3.5360562833375297e-6
Iter 8: ||f(x)|| = 4.4565240386873484e-11
Solution: [0.972628, 357.194]
Residual value: [-3.01183e-11, -4.45652e-11]
Iter 1: ||f(x)|| = 596.0
Iter 2: ||f(x)|| = 7.131711706535498
Iter 3: ||f(x)|| = 0.10167562814876874
Iter 4: ||f(x)|| = 0.05309739157837612
Iter 5: ||f(x)|| = 0.015126623572541575
Iter 6: ||f(x)|| = 0.0009951869078577147
Iter 7: ||f(x)|| = 3.776490302698221e-6
Iter 8: ||f(x)|| = 5.093170329928398e-11
Solution: [0.978383, 357.218]
Residual value: [-3.41144e-11, -5.09317e-11]
Iter 1: ||f(x)|| = 598.0
Iter 2: ||f(x)|| = 7.15564362501118
Iter 3: ||f(x)|| = 0.10258971935945738
Iter 4: ||f(x)|| = 0.05370979188228375
Iter 5: ||f(x)|| = 0.01542617665927537
Iter 6: ||f(x)|| = 0.0010311902151443064
Iter 7: ||f(x)|| = 4.030179297842551e-6
Iter 8: ||f(x)|| = 6.184563972055912e-11
Solution: [0.984113, 357.242]
Residual value: [-3.85833e-11, -6.18456e-11]
Iter 1: ||f(x)|| = 600.0
Iter 2: ||f(x)|| = 7.179575543499595

```

```

Iter 3: ||f(x)|| = 0.10350370824198762
Iter 4: ||f(x)|| = 0.05432241837934271
Iter 5: ||f(x)|| = 0.015728047324955696
Iter 6: ||f(x)|| = 0.0010680702589525026
Iter 7: ||f(x)|| = 4.2977007979061455e-6
Iter 8: ||f(x)|| = 6.730260793119669e-11
Solution: [0.989819, 357.267]
Residual value: [-4.35748e-11, -6.73026e-11]
Iter 1: ||f(x)|| = 602.0
Iter 2: ||f(x)|| = 7.203507461974368
Iter 3: ||f(x)|| = 0.10441758863544237
Iter 4: ||f(x)|| = 0.05493524976827757
Iter 5: ||f(x)|| = 0.016032212957725278
Iter 6: ||f(x)|| = 0.0011058377485824167
Iter 7: ||f(x)|| = 4.5796168706147e-6
Iter 8: ||f(x)|| = 8.276401786133647e-11
Solution: [0.995502, 357.291]
Residual value: [-4.91439e-11, -8.2764e-11]
Iter 1: ||f(x)|| = 604.0
Iter 2: ||f(x)|| = 7.2274393804500505
Iter 3: ||f(x)|| = 0.10533135435707663
Iter 4: ||f(x)|| = 0.05554826521893119
Iter 5: ||f(x)|| = 0.016338651030309848
Iter 6: ||f(x)|| = 0.0011445033824202255
Iter 7: ||f(x)|| = 0.00019347316720086383
Iter 8: ||f(x)|| = 4.547473508864641e-10
Solution: [1.0, 357.315]
Residual value: [0.0, -4.54747e-10]
Iter 1: ||f(x)|| = 606.0
Iter 2: ||f(x)|| = 7.251371298929371
Iter 3: ||f(x)|| = 0.10624499924051634
Iter 4: ||f(x)|| = 0.05616144433770387
Iter 5: ||f(x)|| = 0.016647339074552292
Iter 6: ||f(x)|| = 0.0015499751998504507
Iter 7: ||f(x)|| = 2.9091097530908883e-8
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0, 357.339]
Residual value: [0.0, -9.09495e-13]
Iter 1: ||f(x)|| = 608.0
Iter 2: ||f(x)|| = 7.275303217408691
Iter 3: ||f(x)|| = 0.10715851706117974
Iter 4: ||f(x)|| = 0.05677476721666608
Iter 5: ||f(x)|| = 0.016958254703240527
Iter 6: ||f(x)|| = 0.0024331551230716286
Iter 7: ||f(x)|| = 7.169546734075993e-8
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [1.0, 357.363]
Residual value: [-1.11022e-16, -2.72848e-12]

```

```

Iter 1: ||f(x)|| = 610.0
Iter 2: ||f(x)|| = 7.299235135883464
Iter 3: ||f(x)|| = 0.1080719016463263
Iter 4: ||f(x)|| = 0.05738821438171726
Iter 5: ||f(x)|| = 0.017271375626478402
Iter 6: ||f(x)|| = 0.0033190792200912256
Iter 7: ||f(x)|| = 1.3340923032956198e-7
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,357.388]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 612.0
Iter 2: ||f(x)|| = 7.323167054363694
Iter 3: ||f(x)|| = 0.10898514677592175
Iter 4: ||f(x)|| = 0.05800176675347757
Iter 5: ||f(x)|| = 0.017586679602572985
Iter 6: ||f(x)|| = 0.004207683320601063
Iter 7: ||f(x)|| = 2.1441246644826606e-7
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,357.412]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 614.0
Iter 2: ||f(x)|| = 7.347098972838467
Iter 3: ||f(x)|| = 0.10989824624903122
Iter 4: ||f(x)|| = 0.058615405693672074
Iter 5: ||f(x)|| = 0.01790414450897515
Iter 6: ||f(x)|| = 0.005098903488942597
Iter 7: ||f(x)|| = 3.1485069484915584e-7
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,357.436]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 616.0
Iter 2: ||f(x)|| = 7.371030891317787
Iter 3: ||f(x)|| = 0.11081119382470206
Iter 4: ||f(x)|| = 0.0592291129678415
Iter 5: ||f(x)|| = 0.018223748270429496
Iter 6: ||f(x)|| = 0.005992676104142447
Iter 7: ||f(x)|| = 4.3489490053616464e-7
Iter 8: ||f(x)|| = 1.8189894035458565e-12
Solution: [1.0,357.46]
Residual value: [0.0,-1.81899e-12]
Iter 1: ||f(x)|| = 618.0
Iter 2: ||f(x)|| = 7.394962809797107
Iter 3: ||f(x)|| = 0.1117239832674386
Iter 4: ||f(x)|| = 0.059842870726242836
Iter 5: ||f(x)|| = 0.018545468953561794
Iter 6: ||f(x)|| = 0.00688893777623889
Iter 7: ||f(x)|| = 5.747042450821027e-7
Iter 8: ||f(x)|| = 1.8189894035458565e-12

```

```

Solution: [1.0,357.485]
Residual value: [0.0,1.81899e-12]
Iter 1: ||f(x)|| = 620.0
Iter 2: ||f(x)|| = 7.418894728277337
Iter 3: ||f(x)|| = 0.11263660837084899
Iter 4: ||f(x)|| = 0.060456661512944265
Iter 5: ||f(x)|| = 0.018869284666834574
Iter 6: ||f(x)|| = 0.0077876254508737475
Iter 7: ||f(x)|| = 7.344178811763413e-7
Iter 8: ||f(x)|| = 0.0
Solution: [1.0,357.509]
Residual value: [0.0,0.0]
Iter 1: ||f(x)|| = 622.0
Iter 2: ||f(x)|| = 7.442826646756657
Iter 3: ||f(x)|| = 0.11354906285941979
Iter 4: ||f(x)|| = 0.06107046823399287
Iter 5: ||f(x)|| = 0.01919517364603962
Iter 6: ||f(x)|| = 0.008688676325618871
Iter 7: ||f(x)|| = 9.141886039287783e-7
Iter 8: ||f(x)|| = 0.0
Solution: [1.0,357.533]
Residual value: [0.0,0.0]
Iter 1: ||f(x)|| = 624.0
Iter 2: ||f(x)|| = 7.466758565235978
Iter 3: ||f(x)|| = 0.11446134049674583
Iter 4: ||f(x)|| = 0.06168427415377664
Iter 5: ||f(x)|| = 0.01952311420427577
Iter 6: ||f(x)|| = 0.00959202788726543
Iter 7: ||f(x)|| = 1.1141501090605743e-6
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,357.557]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 626.0
Iter 2: ||f(x)|| = 7.49069048371166
Iter 3: ||f(x)|| = 0.11537343500731367
Iter 4: ||f(x)|| = 0.06229806293231377
Iter 5: ||f(x)|| = 0.019853084746500826
Iter 6: ||f(x)|| = 0.010497617949113192
Iter 7: ||f(x)|| = 1.3344497347134165e-6
Iter 8: ||f(x)|| = 1.8189894035458565e-12
Solution: [1.0,357.581]
Residual value: [0.0,1.81899e-12]
Iter 1: ||f(x)|| = 628.0
Iter 2: ||f(x)|| = 7.514622402195528
Iter 3: ||f(x)|| = 0.11628534013834724
Iter 4: ||f(x)|| = 0.06291181850701832
Iter 5: ||f(x)|| = 0.02018506382864871
Iter 6: ||f(x)|| = 0.011405384588215384

```

```

Iter 7: ||f(x)|| = 1.575203896209132e-6
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,357.606]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 630.0
Iter 2: ||f(x)|| = 7.538554320665753
Iter 3: ||f(x)|| = 0.1171970496116046
Iter 4: ||f(x)|| = 0.063525525222758
Iter 5: ||f(x)|| = 0.02051903002848121
Iter 6: ||f(x)|| = 0.012315266200857877
Iter 7: ||f(x)|| = 1.836534465837758e-6
Iter 8: ||f(x)|| = 3.637978807091713e-12
Solution: [1.0,357.63]
Residual value: [-4.07452e-14,-3.63798e-12]
Iter 1: ||f(x)|| = 632.0
Iter 2: ||f(x)|| = 7.562486239145983
Iter 3: ||f(x)|| = 0.11810855714793433
Iter 4: ||f(x)|| = 0.06413916769724892
Iter 5: ||f(x)|| = 0.02085496209383564
Iter 6: ||f(x)|| = 0.0002796111702991766
Iter 7: ||f(x)|| = 7.816288416506723e-8
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,357.654]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 634.0
Iter 2: ||f(x)|| = 7.586418157625303
Iter 3: ||f(x)|| = 0.11901985646727553
Iter 4: ||f(x)|| = 0.06475273093019496
Iter 5: ||f(x)|| = 0.021192838846218365
Iter 6: ||f(x)|| = 0.00020009239051432814
Iter 7: ||f(x)|| = 4.0034137782640755e-8
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [1.0,357.678]
Residual value: [0.0,-2.72848e-12]
Iter 1: ||f(x)|| = 636.0
Iter 2: ||f(x)|| = 7.610350076100076
Iter 3: ||f(x)|| = 0.11993094127683435
Iter 4: ||f(x)|| = 0.0653662001604971
Iter 5: ||f(x)|| = 0.021532639198085235
Iter 6: ||f(x)|| = 0.00011849568352673145
Iter 7: ||f(x)|| = 1.4042598195374012e-8
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,357.703]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 638.0
Iter 2: ||f(x)|| = 7.634281994579396
Iter 3: ||f(x)|| = 0.1208418052565321
Iter 4: ||f(x)|| = 0.06597956099267321

```

```

Iter 5: ||f(x)|| = 0.02187434222742013
Iter 6: ||f(x)|| = 3.4819862478330244e-5
Iter 7: ||f(x)|| = 1.2123806403252502e-9
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,357.727]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 640.0
Iter 2: ||f(x)|| = 7.658213913059626
Iter 3: ||f(x)|| = 0.12175244212539837
Iter 4: ||f(x)|| = 0.06659279927771422
Iter 5: ||f(x)|| = 0.022501515777548775
Iter 6: ||f(x)|| = 6.1302862377488054e-6
Iter 7: ||f(x)|| = 6.366462912410498e-12
Solution: [1.0,357.751]
Residual value: [0.0,-6.36646e-12]
Iter 1: ||f(x)|| = 642.0
Iter 2: ||f(x)|| = 7.682145831534399
Iter 3: ||f(x)|| = 0.12266284557517793
Iter 4: ||f(x)|| = 0.06720590121130954
Iter 5: ||f(x)|| = 0.02332559996011696
Iter 6: ||f(x)|| = 6.587471034436021e-6
Iter 7: ||f(x)|| = 1.8189894035458565e-12
Solution: [1.0,357.775]
Residual value: [0.0,-1.81899e-12]
Iter 1: ||f(x)|| = 644.0
Iter 2: ||f(x)|| = 7.706077750014629
Iter 3: ||f(x)|| = 0.12357300928215409
Iter 4: ||f(x)|| = 0.06781885325017356
Iter 5: ||f(x)|| = 0.024150041980647075
Iter 6: ||f(x)|| = 7.061293217702769e-6
Iter 7: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,357.799]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 646.0
Iter 2: ||f(x)|| = 7.730009668493949
Iter 3: ||f(x)|| = 0.12448292691988172
Iter 4: ||f(x)|| = 0.06843164210749819
Iter 5: ||f(x)|| = 0.024974822972581023
Iter 6: ||f(x)|| = 7.551770067948382e-6
Iter 7: ||f(x)|| = 0.0
Solution: [1.0,357.824]
Residual value: [0.0,0.0]
Iter 1: ||f(x)|| = 648.0
Iter 2: ||f(x)|| = 7.753941586973269
Iter 3: ||f(x)|| = 0.12539259215282073
Iter 4: ||f(x)|| = 0.0690442547765997
Iter 5: ||f(x)|| = 0.02579992437222245
Iter 6: ||f(x)|| = 8.0589215940563e-6

```

```

Iter 7: ||f(x)|| = 6.366462912410498e-12
Solution: [1.0,357.848]
Residual value: [0.0,-6.36646e-12]
Iter 1: ||f(x)|| = 650.0
Iter 2: ||f(x)|| = 7.777873505448042
Iter 3: ||f(x)|| = 0.12630199866907788
Iter 4: ||f(x)|| = 0.06965667853364721
Iter 5: ||f(x)|| = 0.02662532799604378
Iter 6: ||f(x)|| = 8.582736882090103e-6
Iter 7: ||f(x)|| = 1.8189894035458565e-12
Solution: [1.0,357.872]
Residual value: [0.0,1.81899e-12]
Iter 1: ||f(x)|| = 652.0
Iter 2: ||f(x)|| = 7.801805423927362
Iter 3: ||f(x)|| = 0.12721114012583712
Iter 4: ||f(x)|| = 0.07026890089491644
Iter 5: ||f(x)|| = 0.0274510160279533
Iter 6: ||f(x)|| = 9.123212294070981e-6
Iter 7: ||f(x)|| = 5.4569682106375694e-12
Solution: [1.0,357.896]
Residual value: [0.0,5.45697e-12]
Iter 1: ||f(x)|| = 654.0
Iter 2: ||f(x)|| = 7.82573734241214
Iter 3: ||f(x)|| = 0.12812001017027796
Iter 4: ||f(x)|| = 0.07088090963043214
Iter 5: ||f(x)|| = 0.028276970987462846
Iter 6: ||f(x)|| = 9.6803805718082e-6
Iter 7: ||f(x)|| = 4.547473508864641e-12
Solution: [1.0,357.921]
Residual value: [0.0,4.54747e-12]
Iter 1: ||f(x)|| = 656.0
Iter 2: ||f(x)|| = 7.849669260881456
Iter 3: ||f(x)|| = 0.12902860247504577
Iter 4: ||f(x)|| = 0.07149269275123515
Iter 5: ||f(x)|| = 0.029103175736054254
Iter 6: ||f(x)|| = 1.0254232620354742e-5
Iter 7: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,357.945]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 658.0
Iter 2: ||f(x)|| = 7.873601179366233
Iter 3: ||f(x)|| = 0.1299369106618542
Iter 4: ||f(x)|| = 0.07210423851756786
Iter 5: ||f(x)|| = 0.029929613446256553
Iter 6: ||f(x)|| = 1.0844766620721202e-5
Iter 7: ||f(x)|| = 1.8189894035458565e-12
Solution: [1.0,357.969]
Residual value: [0.0,-1.81899e-12]

```

```

Iter 1: ||f(x)|| = 660.0
Iter 2: ||f(x)|| = 7.897533097846463
Iter 3: ||f(x)|| = 0.13084492837879225
Iter 4: ||f(x)|| = 0.0727155354061324
Iter 5: ||f(x)|| = 0.030756267618016864
Iter 6: ||f(x)|| = 1.1451996215328109e-5
Iter 7: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,357.993]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 662.0
Iter 2: ||f(x)|| = 7.921465016320326
Iter 3: ||f(x)|| = 0.13175264929122932
Iter 4: ||f(x)|| = 0.07332657216193184
Iter 5: ||f(x)|| = 0.03158312208051939
Iter 6: ||f(x)|| = 1.207590594276553e-5
Iter 7: ||f(x)|| = 1.7660317652712365e-12
Solution: [1.0,358.017]
Residual value: [-1.76603e-12,9.09495e-13]
Iter 1: ||f(x)|| = 664.0
Iter 2: ||f(x)|| = 7.945396934800556
Iter 3: ||f(x)|| = 0.13266006699359423
Iter 4: ||f(x)|| = 0.0739373376900403
Iter 5: ||f(x)|| = 0.03241016095307714
Iter 6: ||f(x)|| = 1.2716505807475187e-5
Iter 7: ||f(x)|| = 6.366462912410498e-12
Solution: [1.0,358.042]
Residual value: [0.0,-6.36646e-12]
Iter 1: ||f(x)|| = 666.0
Iter 2: ||f(x)|| = 7.969328853275329
Iter 3: ||f(x)|| = 0.13356717512579053
Iter 4: ||f(x)|| = 0.07454782119657466
Iter 5: ||f(x)|| = 0.0332373686860592
Iter 6: ||f(x)|| = 1.3373773072089534e-5
Iter 7: ||f(x)|| = 6.366462912410498e-12
Solution: [1.0,358.066]
Residual value: [0.0,-6.36646e-12]
Iter 1: ||f(x)|| = 668.0
Iter 2: ||f(x)|| = 7.993260771745554
Iter 3: ||f(x)|| = 0.13447396734773065
Iter 4: ||f(x)|| = 0.07515801201316208
Iter 5: ||f(x)|| = 0.034064729981764685
Iter 6: ||f(x)|| = 1.4047744116396643e-5
Iter 7: ||f(x)|| = 2.7284841053187847e-12
Solution: [1.0,358.09]
Residual value: [0.0,-2.72848e-12]
Iter 1: ||f(x)|| = 670.0
Iter 2: ||f(x)|| = 8.01719269023397
Iter 3: ||f(x)|| = 0.13538043723565352

```



```

Iter 4: ||f(x)|| = 0.0757678997288167
Iter 5: ||f(x)|| = 0.0348922298535399
Iter 6: ||f(x)|| = 1.4738368918187916e-5
Iter 7: ||f(x)|| = 4.547473508864641e-12
Solution: [1.0,358.114]
Residual value: [0.0,-4.54747e-12]
Iter 1: ||f(x)|| = 672.0
Iter 2: ||f(x)|| = 8.041124608710561
Iter 3: ||f(x)|| = 0.13628657842946268
Iter 4: ||f(x)|| = 0.07637747413809848
Iter 5: ||f(x)|| = 0.03571985359030805
Iter 6: ||f(x)|| = 1.5445679309777915e-5
Iter 7: ||f(x)|| = 5.4569682106375694e-12
Solution: [1.0,358.139]
Residual value: [0.0,-5.45697e-12]
Iter 1: ||f(x)|| = 674.0
Iter 2: ||f(x)|| = 8.065056527189881
Iter 3: ||f(x)|| = 0.13719238453995786
Iter 4: ||f(x)|| = 0.07698672521019034
Iter 5: ||f(x)|| = 0.03654758675656922
Iter 6: ||f(x)|| = 1.6169660739251412e-5
Iter 7: ||f(x)|| = 6.366462912410498e-12
Solution: [1.0,358.163]
Residual value: [0.0,-6.36646e-12]
Iter 1: ||f(x)|| = 676.0
Iter 2: ||f(x)|| = 8.088988445669202
Iter 3: ||f(x)|| = 0.13809784918521473
Iter 4: ||f(x)|| = 0.0775956431425584
Iter 5: ||f(x)|| = 0.03737541518876242
Iter 6: ||f(x)|| = 1.6910290469240863e-5
Iter 7: ||f(x)|| = 3.637978807091713e-12
Solution: [1.0,358.187]
Residual value: [0.0,-3.63798e-12]
Iter 1: ||f(x)|| = 678.0
Iter 2: ||f(x)|| = 8.112920364148522
Iter 3: ||f(x)|| = 0.1390029659605716
Iter 4: ||f(x)|| = 0.0782042182972873
Iter 5: ||f(x)|| = 0.03820332498798962
Iter 6: ||f(x)|| = 1.7667583051661495e-5
Iter 7: ||f(x)|| = 3.121378711057332e-10
Solution: [1.0,358.211]
Residual value: [-3.12138e-10,-3.08319e-10]
Iter 1: ||f(x)|| = 680.0
Iter 2: ||f(x)|| = 8.136852282628752
Iter 3: ||f(x)|| = 0.13990772846955224
Iter 4: ||f(x)|| = 0.07881244121290365
Iter 5: ||f(x)|| = 0.03903130252183473
Iter 6: ||f(x)|| = 1.844151393015636e-5

```

```

Iter 7: ||f(x)|| = 5.4569682106375694e-12
Solution: [1.0,358.235]
Residual value: [0.0,-5.45697e-12]
Iter 1: ||f(x)|| = 682.0
Iter 2: ||f(x)|| = 8.160784201103525
Iter 3: ||f(x)|| = 0.1408121303156804
Iter 4: ||f(x)|| = 0.0794203026462128
Iter 5: ||f(x)|| = 0.03985933438434586
Iter 6: ||f(x)|| = 1.9232068552810233e-5
Iter 7: ||f(x)|| = 1.8189894035458565e-12
Solution: [1.0,358.26]
Residual value: [0.0,-1.81899e-12]
Iter 1: ||f(x)|| = 684.0
Iter 2: ||f(x)|| = 8.184716119582845
Iter 3: ||f(x)|| = 0.14171616510793683
Iter 4: ||f(x)|| = 0.08002779348953482
Iter 5: ||f(x)|| = 0.04068740743332455
Iter 6: ||f(x)|| = 2.0039258743054233e-5
Iter 7: ||f(x)|| = 2.7284841053187847e-12
Solution: [1.0,358.284]
Residual value: [0.0,-2.72848e-12]
Iter 1: ||f(x)|| = 686.0
Iter 2: ||f(x)|| = 8.208648038062165
Iter 3: ||f(x)|| = 0.14261982643165538
Iter 4: ||f(x)|| = 0.080634904847102
Iter 5: ||f(x)|| = 0.041515508758493525
Iter 6: ||f(x)|| = 2.0863064492004924e-5
Iter 7: ||f(x)|| = 8.185452315956354e-12
Solution: [1.0,358.308]
Residual value: [0.0,-8.18545e-12]
Iter 1: ||f(x)|| = 688.0
Iter 2: ||f(x)|| = 8.232579956542395
Iter 3: ||f(x)|| = 0.14352310788035538
Iter 4: ||f(x)|| = 0.08124162796866585
Iter 5: ||f(x)|| = 0.04234362571969541
Iter 6: ||f(x)|| = 2.1703460333810654e-5
Iter 7: ||f(x)|| = 4.547473508864641e-12
Solution: [1.0,358.332]
Residual value: [0.0,-4.54747e-12]
Iter 1: ||f(x)|| = 690.0
Iter 2: ||f(x)|| = 8.256511875016258
Iter 3: ||f(x)|| = 0.14442600302845676
Iter 4: ||f(x)|| = 0.08184795428678626
Iter 5: ||f(x)|| = 0.04317174584957684
Iter 6: ||f(x)|| = 2.2560458091902547e-5
Iter 7: ||f(x)|| = 6.366462912410498e-12
Solution: [1.0,358.357]
Residual value: [0.0,-6.36646e-12]

```

```

Iter 1: ||f(x)|| = 692.0
Iter 2: ||f(x)|| = 8.280443793496488
Iter 3: ||f(x)|| = 0.1453285054931257
Iter 4: ||f(x)|| = 0.08245387538499926
Iter 5: ||f(x)|| = 0.04399985695272335
Iter 6: ||f(x)|| = 2.343401502002962e-5
Iter 7: ||f(x)|| = 1.0913936421275139e-11
Solution: [1.0,358.381]
Residual value: [0.0,-1.09139e-11]
Iter 1: ||f(x)|| = 694.0
Iter 2: ||f(x)|| = 8.304375711971261
Iter 3: ||f(x)|| = 0.1462306088378682
Iter 4: ||f(x)|| = 0.08305938300964044
Iter 5: ||f(x)|| = 0.04482794704836124
Iter 6: ||f(x)|| = 2.432415021758061e-5
Iter 7: ||f(x)|| = 7.275957614183426e-12
Solution: [1.0,358.405]
Residual value: [0.0,-7.27596e-12]
Iter 1: ||f(x)|| = 696.0
Iter 2: ||f(x)|| = 8.328307630446034
Iter 3: ||f(x)|| = 0.14713230664347066
Iter 4: ||f(x)|| = 0.08366446905256453
Iter 5: ||f(x)|| = 0.045656004353986646
Iter 6: ||f(x)|| = 2.523081457184162e-5
Iter 7: ||f(x)|| = 4.547473508864641e-12
Solution: [1.0,358.429]
Residual value: [0.0,-4.54747e-12]
Iter 1: ||f(x)|| = 698.0
Iter 2: ||f(x)|| = 8.352239548930811
Iter 3: ||f(x)|| = 0.14803359252164228
Iter 4: ||f(x)|| = 0.08426912559025368
Iter 5: ||f(x)|| = 0.04648401732356433
Iter 6: ||f(x)|| = 2.6154020815738477e-5
Iter 7: ||f(x)|| = 4.547473508864641e-12
Solution: [1.0,358.453]
Residual value: [0.0,-4.54747e-12]
Iter 1: ||f(x)|| = 700.0
Iter 2: ||f(x)|| = 8.376171467410131
Iter 3: ||f(x)|| = 0.14893446000951371
Iter 4: ||f(x)|| = 0.08487334481833386
Iter 5: ||f(x)|| = 0.04731197458568204
Iter 6: ||f(x)|| = 2.709374348341953e-5
Iter 7: ||f(x)|| = 7.275957614183426e-12
Solution: [1.0,358.478]
Residual value: [0.0,-7.27596e-12]
Iter 1: ||f(x)|| = 702.0
Iter 2: ||f(x)|| = 8.400103385884904
Iter 3: ||f(x)|| = 0.14983490272607014

```

```

Iter 4: ||f(x)|| = 0.08547711908886413
Iter 5: ||f(x)|| = 0.04813986501631007
Iter 6: ||f(x)|| = 2.8049959837517235e-5
Iter 7: ||f(x)|| = 1.2732925824820995e-11
Solution: [1.0,358.502]
Residual value: [0.0,-1.27329e-11]
Iter 1: ||f(x)|| = 704.0
Iter 2: ||f(x)|| = 8.424035304369681
Iter 3: ||f(x)|| = 0.1507349142266321
Iter 4: ||f(x)|| = 0.08608044088850875
Iter 5: ||f(x)|| = 0.04896767765421828
Iter 6: ||f(x)|| = 2.902265350712696e-5
Iter 7: ||f(x)|| = 1.3642420526593924e-11
Solution: [1.0,358.526]
Residual value: [0.0,-1.36424e-11]
Iter 1: ||f(x)|| = 706.0
Iter 2: ||f(x)|| = 8.447967222844454
Iter 3: ||f(x)|| = 0.1516344880710676
Iter 4: ||f(x)|| = 0.08668330286764103
Iter 5: ||f(x)|| = 0.049795401748269796
Iter 6: ||f(x)|| = 3.0011812668817583e-5
Iter 7: ||f(x)|| = 1.546140993013978e-11
Solution: [1.0,358.55]
Residual value: [0.0,-1.54614e-11]
Iter 1: ||f(x)|| = 708.0
Iter 2: ||f(x)|| = 8.47189914133287
Iter 3: ||f(x)|| = 0.15253361785380548
Iter 4: ||f(x)|| = 0.08728569778304518
Iter 5: ||f(x)|| = 0.05062302674195962
Iter 6: ||f(x)|| = 3.101741458522156e-5
Iter 7: ||f(x)|| = 1.1823431123048067e-11
Solution: [1.0,358.575]
Residual value: [0.0,-1.18234e-11]
Iter 1: ||f(x)|| = 710.0
Iter 2: ||f(x)|| = 8.495831059803095
Iter 3: ||f(x)|| = 0.15343229715472262
Iter 4: ||f(x)|| = 0.08788761855339544
Iter 5: ||f(x)|| = 0.05145054224794876
Iter 6: ||f(x)|| = 3.2039448342402466e-5
Iter 7: ||f(x)|| = 1.1823431123048067e-11
Solution: [1.0,358.599]
Residual value: [0.0,-1.18234e-11]
Iter 1: ||f(x)|| = 712.0
Iter 2: ||f(x)|| = 8.519762978277868
Iter 3: ||f(x)|| = 0.15433051951549714
Iter 4: ||f(x)|| = 0.08848905820286745
Iter 5: ||f(x)|| = 0.052277938100814936
Iter 6: ||f(x)|| = 3.307787756057223e-5

```

```

Iter 7: ||f(x)|| = 1.3642420526593924e-11
Solution: [1.0,358.623]
Residual value: [0.0,-1.36424e-11]
Iter 1: ||f(x)|| = 714.0
Iter 2: ||f(x)|| = 8.543694896758097
Iter 3: ||f(x)|| = 0.15522827853692434
Iter 4: ||f(x)|| = 0.08909000990115601
Iter 5: ||f(x)|| = 0.05310520426155563
Iter 6: ||f(x)|| = 3.413269041629974e-5
Iter 7: ||f(x)|| = 1.000444171950221e-11
Solution: [1.0,358.647]
Residual value: [0.0,-1.00044e-11]
Iter 1: ||f(x)|| = 716.0
Iter 2: ||f(x)|| = 8.56762681523378
Iter 3: ||f(x)|| = 0.15612556777432474
Iter 4: ||f(x)|| = 0.08969046695892757
Iter 5: ||f(x)|| = 0.053932330895804625
Iter 6: ||f(x)|| = 3.520386508171214e-5
Iter 7: ||f(x)|| = 1.1823431123048067e-11
Solution: [1.0,358.671]
Residual value: [0.0,-1.18234e-11]
Iter 1: ||f(x)|| = 718.0
Iter 2: ||f(x)|| = 8.5915587337131
Iter 3: ||f(x)|| = 0.15702238080302777
Iter 4: ||f(x)|| = 0.09029042276415566
Iter 5: ||f(x)|| = 0.05475930834745668
Iter 6: ||f(x)|| = 3.629138973337831e-5
Iter 7: ||f(x)|| = 1.2732925824820995e-11
Solution: [1.0,358.696]
Residual value: [0.0,-1.27329e-11]
Iter 1: ||f(x)|| = 720.0
Iter 2: ||f(x)|| = 8.615490652187873
Iter 3: ||f(x)|| = 0.15791871118562995
Iter 4: ||f(x)|| = 0.09088987088489375
Iter 5: ||f(x)|| = 0.05558612712047761
Iter 6: ||f(x)|| = 3.739522708201548e-5
Iter 7: ||f(x)|| = 1.3642420526593924e-11
Solution: [1.0,358.72]
Residual value: [0.0,-1.36424e-11]
Iter 1: ||f(x)|| = 722.0
Iter 2: ||f(x)|| = 8.63942257067265
Iter 3: ||f(x)|| = 0.15881455251565058
Iter 4: ||f(x)|| = 0.09148880495285994
Iter 5: ||f(x)|| = 0.056412777889818244
Iter 6: ||f(x)|| = 3.851535711874021e-5
Iter 7: ||f(x)|| = 1.4551915228366852e-11
Solution: [1.0,358.744]
Residual value: [0.0,-1.45519e-11]

```

```

Iter 1: ||f(x)|| = 724.0
Iter 2: ||f(x)|| = 8.663354489147423
Iter 3: ||f(x)|| = 0.15970989833931526
Iter 4: ||f(x)|| = 0.09208721875165793
Iter 5: ||f(x)|| = 0.057239251476858044
Iter 6: ||f(x)|| = 3.965176892961608e-5
Iter 7: ||f(x)|| = 2.000888343900442e-11
Solution: [1.0,358.768]
Residual value: [0.0,-2.00089e-11]
Iter 1: ||f(x)|| = 726.0
Iter 2: ||f(x)|| = 8.687286407626743
Iter 3: ||f(x)|| = 0.16060474222740595
Iter 4: ||f(x)|| = 0.09268510616948333
Iter 5: ||f(x)|| = 0.05806553887032351
Iter 6: ||f(x)|| = 4.08044152209186e-5
Iter 7: ||f(x)|| = 2.637534635141492e-11
Solution: [1.0,358.792]
Residual value: [0.0,-2.63753e-11]
Iter 1: ||f(x)|| = 728.0
Iter 2: ||f(x)|| = 8.711218326106064
Iter 3: ||f(x)|| = 0.1614990777525236
Iter 4: ||f(x)|| = 0.09328246119639516
Iter 5: ||f(x)|| = 0.05889163122537866
Iter 6: ||f(x)|| = 4.1973292354668956e-5
Iter 7: ||f(x)|| = 2.7284841053187847e-11
Solution: [1.0,358.817]
Residual value: [0.0,-2.72848e-11]
Iter 1: ||f(x)|| = 730.0
Iter 2: ||f(x)|| = 8.735150244586293
Iter 3: ||f(x)|| = 0.1623928984890881
Iter 4: ||f(x)|| = 0.0938792779461437
Iter 5: ||f(x)|| = 0.05971751983361173
Iter 6: ||f(x)|| = 4.3158385778951924e-5
Iter 7: ||f(x)|| = 2.4556356947869062e-11
Solution: [1.0,358.841]
Residual value: [0.0,-2.45564e-11]
Iter 1: ||f(x)|| = 732.0
Iter 2: ||f(x)|| = 8.759082163060157
Iter 3: ||f(x)|| = 0.16328619801242894
Iter 4: ||f(x)|| = 0.09447555064070912
Iter 5: ||f(x)|| = 0.060543196139406064
Iter 6: ||f(x)|| = 4.435963546711719e-5
Iter 7: ||f(x)|| = 1.546140993013978e-11
Solution: [1.0,358.865]
Residual value: [0.0,-1.54614e-11]
Iter 1: ||f(x)|| = 734.0
Iter 2: ||f(x)|| = 8.783014081544934
Iter 3: ||f(x)|| = 0.16417896987513814

```

```

Iter 4: ||f(x)|| = 0.09507127358028811
Iter 5: ||f(x)|| = 0.061368651726297685
Iter 6: ||f(x)|| = 4.557703869068064e-5
Iter 7: ||f(x)|| = 2.1827872842550278e-11
Solution: [1.0,358.889]
Residual value: [0.0,-2.18279e-11]
Iter 1: ||f(x)|| = 736.0
Iter 2: ||f(x)|| = 8.80694600001516
Iter 3: ||f(x)|| = 0.16507120767801098
Iter 4: ||f(x)|| = 0.0956664411978636
Iter 5: ||f(x)|| = 0.06219387834516965
Iter 6: ||f(x)|| = 4.681057089328533e-5
Iter 7: ||f(x)|| = 2.7284841053187847e-11
Solution: [1.0,358.914]
Residual value: [0.0,-2.72848e-11]
Iter 1: ||f(x)|| = 738.0
Iter 2: ||f(x)|| = 8.830877918499027
Iter 3: ||f(x)|| = 0.16596290496818256
Iter 4: ||f(x)|| = 0.09626104801736801
Iter 5: ||f(x)|| = 0.06301886787332478
Iter 6: ||f(x)|| = 4.8060186600196175e-5
Iter 7: ||f(x)|| = 2.9103830456733704e-11
Solution: [1.0,358.938]
Residual value: [0.0,-2.91038e-11]
Iter 1: ||f(x)|| = 740.0
Iter 2: ||f(x)|| = 8.854809836979257
Iter 3: ||f(x)|| = 0.16685405534281017
Iter 4: ||f(x)|| = 0.09685508866732562
Iter 5: ||f(x)|| = 0.06384361231539515
Iter 6: ||f(x)|| = 4.932587762596086e-5
Iter 7: ||f(x)|| = 3.001332515850663e-11
Solution: [1.0,358.962]
Residual value: [0.0,-3.00133e-11]
Iter 1: ||f(x)|| = 742.0
Iter 2: ||f(x)|| = 8.87874175545312
Iter 3: ||f(x)|| = 0.16774465236176184
Iter 4: ||f(x)|| = 0.09744855785629625
Iter 5: ||f(x)|| = 0.06466810382153199
Iter 6: ||f(x)|| = 5.060761759523302e-5
Iter 7: ||f(x)|| = 3.092281986027956e-11
Solution: [1.0,358.986]
Residual value: [0.0,-3.09228e-11]
Iter 1: ||f(x)|| = 744.0
Iter 2: ||f(x)|| = 8.90267367393335
Iter 3: ||f(x)|| = 0.1686422307637934
Iter 4: ||f(x)|| = 0.0980432858086715
Iter 5: ||f(x)|| = 0.06549253125467658
Iter 6: ||f(x)|| = 5.190566662349738e-5

```

```

Iter 7: ||f(x)|| = 3.183231456205249e-11
Solution: [1.0,359.01]
Residual value: [0.0,-3.18323e-11]
Iter 1: ||f(x)|| = 746.0
Iter 2: ||f(x)|| = 8.92660559241267
Iter 3: ||f(x)|| = 0.1695411407626826
Iter 4: ||f(x)|| = 0.09863789288010594
Iter 5: ||f(x)|| = 0.06631673137326288
Iter 6: ||f(x)|| = 5.321979188011028e-5
Iter 7: ||f(x)|| = 3.2741809263825417e-11
Solution: [1.0,359.035]
Residual value: [0.0,-3.27418e-11]
Iter 1: ||f(x)|| = 748.0
Iter 2: ||f(x)|| = 8.950537510888353
Iter 3: ||f(x)|| = 0.17043973237576263
Iter 4: ||f(x)|| = 0.09923197391071881
Iter 5: ||f(x)|| = 0.06714065281903459
Iter 6: ||f(x)|| = 5.454987422126578e-5
Iter 7: ||f(x)|| = 3.9108272176235914e-11
Solution: [1.0,359.059]
Residual value: [0.0,-3.91083e-11]
Iter 1: ||f(x)|| = 750.0
Iter 2: ||f(x)|| = 8.974469429368582
Iter 3: ||f(x)|| = 0.17133800258860746
Iter 4: ||f(x)|| = 0.09982552481324092
Iter 5: ||f(x)|| = 0.06796428815050604
Iter 6: ||f(x)|| = 5.589588447885152e-5
Iter 7: ||f(x)|| = 3.124175362856363e-9
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [1.0,359.083]
Residual value: [0.0,-2.72848e-12]
Iter 1: ||f(x)|| = 752.0
Iter 2: ||f(x)|| = 8.998401347847903
Iter 3: ||f(x)|| = 0.17223594840873313
Iter 4: ||f(x)|| = 0.10050995224121
Iter 5: ||f(x)|| = 0.06878763000804611
Iter 6: ||f(x)|| = 5.725779283238808e-5
Iter 7: ||f(x)|| = 4.092726157978177e-11
Solution: [1.0,359.107]
Residual value: [0.0,-4.09273e-11]
Iter 1: ||f(x)|| = 754.0
Iter 2: ||f(x)|| = 9.022333266322676
Iter 3: ||f(x)|| = 0.17313356686567044
Iter 4: ||f(x)|| = 0.10119712136188001
Iter 5: ||f(x)|| = 0.06961067118754727
Iter 6: ||f(x)|| = 5.8635586356103886e-5
Iter 7: ||f(x)|| = 4.274625098332763e-11
Solution: [1.0,359.132]

```



```

Residual value: [0.0,-4.27463e-11]
Iter 1: ||f(x)|| = 756.0
Iter 2: ||f(x)|| = 9.046265184801996
Iter 3: ||f(x)|| = 0.17403085501107118
Iter 4: ||f(x)|| = 0.10188437643783306
Iter 5: ||f(x)|| = 0.07043340458858438
Iter 6: ||f(x)|| = 6.0029210544598754e-5
Iter 7: ||f(x)|| = 4.3655745685100555e-11
Solution: [1.0,359.156]
Residual value: [0.0,-4.36557e-11]
Iter 1: ||f(x)|| = 758.0
Iter 2: ||f(x)|| = 9.070197103281316
Iter 3: ||f(x)|| = 0.1749278099187791
Iter 4: ||f(x)|| = 0.10257170809128772
Iter 5: ||f(x)|| = 0.0712558232489755
Iter 6: ||f(x)|| = 6.143865357444156e-5
Iter 7: ||f(x)|| = 4.9112713895738125e-11
Solution: [1.0,359.18]
Residual value: [0.0,-4.91127e-11]
Iter 1: ||f(x)|| = 760.0
Iter 2: ||f(x)|| = 9.094129021756089
Iter 3: ||f(x)|| = 0.17582442868495363
Iter 4: ||f(x)|| = 0.10325910707487229
Iter 5: ||f(x)|| = 0.0720779202747508
Iter 6: ||f(x)|| = 6.286387088039191e-5
Iter 7: ||f(x)|| = 4.547473508864641e-11
Solution: [1.0,359.204]
Residual value: [0.0,-4.54747e-11]
Iter 1: ||f(x)|| = 762.0
Iter 2: ||f(x)|| = 9.118060940240866
Iter 3: ||f(x)|| = 0.1767207084281061
Iter 4: ||f(x)|| = 0.10394656426966173
Iter 5: ||f(x)|| = 0.072899688929283
Iter 6: ||f(x)|| = 6.430484882002929e-5
Iter 7: ||f(x)|| = 5.184119800105691e-11
Solution: [1.0,359.228]
Residual value: [0.0,-5.18412e-11]
Iter 1: ||f(x)|| = 764.0
Iter 2: ||f(x)|| = 9.141992858711092
Iter 3: ||f(x)|| = 0.17761664628922857
Iter 4: ||f(x)|| = 0.10463407068331852
Iter 5: ||f(x)|| = 0.0737211225741703
Iter 6: ||f(x)|| = 6.576153191417689e-5
Iter 7: ||f(x)|| = 5.275069270282984e-11
Solution: [1.0,359.253]
Residual value: [0.0,-5.27507e-11]
Iter 1: ||f(x)|| = 766.0
Iter 2: ||f(x)|| = 9.165924777200416

```

```

Iter 3: ||f(x)|| = 0.1785122394318479
Iter 4: ||f(x)|| = 0.1053216174481892
Iter 5: ||f(x)|| = 0.07454221465377486
Iter 6: ||f(x)|| = 6.723390561091946e-5
Iter 7: ||f(x)|| = 5.3660187404602766e-11
Solution: [1.0,359.277]
Residual value: [0.0,-5.36602e-11]
Iter 1: ||f(x)|| = 768.0
Iter 2: ||f(x)|| = 9.189856695670642
Iter 3: ||f(x)|| = 0.1794074850421138
Iter 4: ||f(x)|| = 0.1060091958195009
Iter 5: ||f(x)|| = 0.07536295874524512
Iter 6: ||f(x)|| = 6.872191897855373e-5
Iter 7: ||f(x)|| = 5.547917680814862e-11
Solution: [1.0,359.301]
Residual value: [0.0,-5.54792e-11]
Iter 1: ||f(x)|| = 770.0
Iter 2: ||f(x)|| = 9.213788614149962
Iter 3: ||f(x)|| = 0.18030238032888346
Iter 4: ||f(x)|| = 0.10669679717355827
Iter 5: ||f(x)|| = 0.07618334852304542
Iter 6: ||f(x)|| = 7.022556110314326e-5
Iter 7: ||f(x)|| = 6.093614501878619e-11
Solution: [1.0,359.325]
Residual value: [0.0,-6.09361e-11]
Iter 1: ||f(x)|| = 772.0
Iter 2: ||f(x)|| = 9.237720532629282
Iter 3: ||f(x)|| = 0.18119692252380476
Iter 4: ||f(x)|| = 0.10738441300596269
Iter 5: ||f(x)|| = 0.07700337775895605
Iter 6: ||f(x)|| = 7.174479014793178e-5
Iter 7: ||f(x)|| = 5.3660187404602766e-11
Solution: [1.0,359.35]
Residual value: [0.0,-5.36602e-11]
Iter 1: ||f(x)|| = 774.0
Iter 2: ||f(x)|| = 9.261652451104055
Iter 3: ||f(x)|| = 0.18209110888135777
Iter 4: ||f(x)|| = 0.10807203492989524
Iter 5: ||f(x)|| = 0.07782304033662513
Iter 6: ||f(x)|| = 7.32795606381842e-5
Iter 7: ||f(x)|| = 6.366462912410498e-11
Solution: [1.0,359.374]
Residual value: [0.0,-6.36646e-11]
Iter 1: ||f(x)|| = 776.0
Iter 2: ||f(x)|| = 9.285584369588832
Iter 3: ||f(x)|| = 0.1829849366789842
Iter 4: ||f(x)|| = 0.10875965467442995
Iter 5: ||f(x)|| = 0.0786423302242838

```

```

Iter 6: ||f(x)|| = 7.482986165996408e-5
Iter 7: ||f(x)|| = 6.45741238258779e-11
Solution: [1.0,359.398]
Residual value: [0.0,-6.45741e-11]
Iter 1: ||f(x)|| = 778.0
Iter 2: ||f(x)|| = 9.309516288063605
Iter 3: ||f(x)|| = 0.18387840321711807
Iter 4: ||f(x)|| = 0.10944726408281569
Iter 5: ||f(x)|| = 0.07946124147201772
Iter 6: ||f(x)|| = 7.639563773409463e-5
Iter 7: ||f(x)|| = 7.003109203651547e-11
Solution: [1.0,359.422]
Residual value: [0.0,-7.00311e-11]
Iter 1: ||f(x)|| = 780.0
Iter 2: ||f(x)|| = 9.333448206542926
Iter 3: ||f(x)|| = 0.18477150581927013
Iter 4: ||f(x)|| = 0.11013485511088218
Iter 5: ||f(x)|| = 0.08027976826906524
Iter 6: ||f(x)|| = 7.797686976118712e-5
Iter 7: ||f(x)|| = 7.185008144006133e-11
Solution: [1.0,359.446]
Residual value: [0.0,-7.18501e-11]
Iter 1: ||f(x)|| = 782.0
Iter 2: ||f(x)|| = 9.357380125023155
Iter 3: ||f(x)|| = 0.1856642418320948
Iter 4: ||f(x)|| = 0.11082241982539605
Iter 5: ||f(x)|| = 0.08109790486287238
Iter 6: ||f(x)|| = 7.957351135701174e-5
Iter 7: ||f(x)|| = 7.185008144006133e-11
Solution: [1.0,359.471]
Residual value: [0.0,-7.18501e-11]
Iter 1: ||f(x)|| = 784.0
Iter 2: ||f(x)|| = 9.381312043497928
Iter 3: ||f(x)|| = 0.18655660862545462
Iter 4: ||f(x)|| = 0.1115099504024778
Iter 5: ||f(x)|| = 0.08191564560002007
Iter 6: ||f(x)|| = 8.118554160319036e-5
Iter 7: ||f(x)|| = 8.276401786133647e-11
Solution: [1.0,359.495]
Residual value: [0.0,-8.2764e-11]
Iter 1: ||f(x)|| = 786.0
Iter 2: ||f(x)|| = 9.405243961981796
Iter 3: ||f(x)|| = 0.1874486035925194
Iter 4: ||f(x)|| = 0.1121974391260825
Iter 5: ||f(x)|| = 0.08273298491167225
Iter 6: ||f(x)|| = 8.281290229206206e-5
Iter 7: ||f(x)|| = 8.36735125631094e-11
Solution: [1.0,359.519]

```

```

Residual value: [0.0,-8.36735e-11]
Iter 1: ||f(x)|| = 788.0
Iter 2: ||f(x)|| = 9.429175880456569
Iter 3: ||f(x)|| = 0.18834022414976226
Iter 4: ||f(x)|| = 0.11288487838640192
Iter 5: ||f(x)|| = 0.08354991732903727
Iter 6: ||f(x)|| = 8.445559160463745e-5
Iter 7: ||f(x)|| = 8.549250196665525e-11
Solution: [1.0,359.543]
Residual value: [0.0,-8.54925e-11]
Iter 1: ||f(x)|| = 790.0
Iter 2: ||f(x)|| = 9.453107798936799
Iter 3: ||f(x)|| = 0.18923146773710894
Iter 4: ||f(x)|| = 0.11357226067844217
Iter 5: ||f(x)|| = 0.08436643745790207
Iter 6: ||f(x)|| = 8.611355951870792e-5
Iter 7: ||f(x)|| = 8.185452315956354e-11
Solution: [1.0,359.568]
Residual value: [0.0,-8.18545e-11]
Iter 1: ||f(x)|| = 792.0
Iter 2: ||f(x)|| = 9.477039717411571
Iter 3: ||f(x)|| = 0.19012233181791144
Iter 4: ||f(x)|| = 0.11425957860047681
Iter 5: ||f(x)|| = 0.08518253999409353
Iter 6: ||f(x)|| = 8.778675328358077e-5
Iter 7: ||f(x)|| = 9.731593308970332e-11
Solution: [1.0,359.592]
Residual value: [0.0,-9.73159e-11]
Iter 1: ||f(x)|| = 794.0
Iter 2: ||f(x)|| = 9.500971635891801
Iter 3: ||f(x)|| = 0.19101281387908342
Iter 4: ||f(x)|| = 0.1149468248526372
Iter 5: ||f(x)|| = 0.08599821974257793
Iter 6: ||f(x)|| = 8.947515379986726e-5
Iter 7: ||f(x)|| = 9.822542779147625e-11
Solution: [1.0,359.616]
Residual value: [0.0,-9.82254e-11]
Iter 1: ||f(x)|| = 796.0
Iter 2: ||f(x)|| = 9.524903554371122
Iter 3: ||f(x)|| = 0.19190291143111188
Iter 4: ||f(x)|| = 0.11563399223548718
Iter 5: ||f(x)|| = 0.08681347152014496
Iter 6: ||f(x)|| = 9.117871832131641e-5
Iter 7: ||f(x)|| = 1.127773430198431e-10
Solution: [1.0,359.64]
Residual value: [0.0,-1.12777e-10]
Iter 1: ||f(x)|| = 798.0
Iter 2: ||f(x)|| = 9.548835472850442

```

```

Iter 3: ||f(x)|| = 0.19279262200812836
Iter 4: ||f(x)|| = 0.1163210736486
Iter 5: ||f(x)|| = 0.08762829030092689
Iter 6: ||f(x)|| = 9.289741683460306e-5
Iter 7: ||f(x)|| = 1.0913936421275139e-10
Solution: [1.0,359.664]
Residual value: [0.0,-1.09139e-10]
Iter 1: ||f(x)|| = 800.0
Iter 2: ||f(x)|| = 9.572767391325215
Iter 3: ||f(x)|| = 0.19368194316796322
Iter 4: ||f(x)|| = 0.11700806208919529
Iter 5: ||f(x)|| = 0.08844267108815984
Iter 6: ||f(x)|| = 9.4631207219531e-5
Iter 7: ||f(x)|| = 8.958522812463343e-9
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [1.0,359.689]
Residual value: [0.0,-2.72848e-12]
Iter 1: ||f(x)|| = 802.0
Iter 2: ||f(x)|| = 9.596699309805444
Iter 3: ||f(x)|| = 0.19457087249220667
Iter 4: ||f(x)|| = 0.1176949506507948
Iter 5: ||f(x)|| = 0.08925660898239585
Iter 6: ||f(x)|| = 9.638005303713726e-5
Iter 7: ||f(x)|| = 1.1186784831807017e-10
Solution: [1.0,359.713]
Residual value: [0.0,-1.11868e-10]
Iter 1: ||f(x)|| = 804.0
Iter 2: ||f(x)|| = 9.620631228280217
Iter 3: ||f(x)|| = 0.1954594075862397
Iter 4: ||f(x)|| = 0.11838173252187724
Iter 5: ||f(x)|| = 0.09007009916422248
Iter 6: ||f(x)|| = 9.814392706175568e-5
Iter 7: ||f(x)|| = 1.1732481652870774e-10
Solution: [1.0,359.737]
Residual value: [0.0,-1.17325e-10]
Iter 1: ||f(x)|| = 806.0
Iter 2: ||f(x)|| = 9.644563146759538
Iter 3: ||f(x)|| = 0.1963475460792995
Iter 4: ||f(x)|| = 0.11906840098457717
Iter 5: ||f(x)|| = 0.09088313687425398
Iter 6: ||f(x)|| = 9.992277318815468e-5
Iter 7: ||f(x)|| = 1.2369127944111824e-10
Solution: [1.0,359.761]
Residual value: [0.0,-1.23691e-10]
Iter 1: ||f(x)|| = 808.0
Iter 2: ||f(x)|| = 9.668495065238858
Iter 3: ||f(x)|| = 0.19723528562454212
Iter 4: ||f(x)|| = 0.11975494941341532

```

```

Iter 5: ||f(x)|| = 0.09169571742950211
Iter 6: ||f(x)|| = 0.00010171657322644023
Iter 7: ||f(x)|| = 1.2369127944111824e-10
Solution: [1.0,359.786]
Residual value: [0.0,-1.23691e-10]
Iter 1: ||f(x)|| = 810.0
Iter 2: ||f(x)|| = 9.69242698371363
Iter 3: ||f(x)|| = 0.1981226238990471
Iter 4: ||f(x)|| = 0.12044137127400421
Iter 5: ||f(x)|| = 0.09250783624975156
Iter 6: ||f(x)|| = 0.00010352526987844612
Iter 7: ||f(x)|| = 1.3096723705530167e-10
Solution: [1.0,359.81]
Residual value: [0.0,-1.30967e-10]
Iter 1: ||f(x)|| = 812.0
Iter 2: ||f(x)|| = 9.716358902198408
Iter 3: ||f(x)|| = 0.19900955860391456
Iter 4: ||f(x)|| = 0.12112766012184753
Iter 5: ||f(x)|| = 0.09331948877115792
Iter 6: ||f(x)|| = 0.00010534884586377302
Iter 7: ||f(x)|| = 1.355147105641663e-10
Solution: [1.0,359.834]
Residual value: [0.0,-1.35515e-10]
Iter 1: ||f(x)|| = 814.0
Iter 2: ||f(x)|| = 9.74029082067318
Iter 3: ||f(x)|| = 0.19989608746425108
Iter 4: ||f(x)|| = 0.12181380960108215
Iter 5: ||f(x)|| = 0.09413067054902058
Iter 6: ||f(x)|| = 0.0001071872393367812
Iter 7: ||f(x)|| = 1.3733369996771216e-10
Solution: [1.0,359.858]
Residual value: [0.0,-1.37334e-10]
Iter 1: ||f(x)|| = 816.0
Iter 2: ||f(x)|| = 9.764222739157958
Iter 3: ||f(x)|| = 0.20078220822927523
Iter 4: ||f(x)|| = 0.12249981344331852
Iter 5: ||f(x)|| = 0.09494137717319973
Iter 6: ||f(x)|| = 0.00010904044120252365
Iter 7: ||f(x)|| = 1.482476363889873e-10
Solution: [1.0,359.882]
Residual value: [0.0,-1.48248e-10]
Iter 1: ||f(x)|| = 818.0
Iter 2: ||f(x)|| = 9.788154657627274
Iter 3: ||f(x)|| = 0.20166791867230077
Iter 4: ||f(x)|| = 0.12318566546641377
Iter 5: ||f(x)|| = 0.09575160431450058
Iter 6: ||f(x)|| = 0.00011090838052041363
Iter 7: ||f(x)|| = 1.4915713109076023e-10

```

Solution: [1.0,359.907]
 Residual value: [0.0,-1.49157e-10]
 Iter 1: ||f(x)|| = 820.0
 Iter 2: ||f(x)|| = 9.812086576107504
 Iter 3: ||f(x)|| = 0.20255321659081163
 Iter 4: ||f(x)|| = 0.12387135957335567
 Iter 5: ||f(x)|| = 0.09656134773013036
 Iter 6: ||f(x)|| = 0.00011279104819550412
 Iter 7: ||f(x)|| = 1.546140993013978e-10
 Solution: [1.0,359.931]
 Residual value: [0.0,-1.54614e-10]
 Iter 1: ||f(x)|| = 822.0
 Iter 2: ||f(x)|| = 9.836018494586824
 Iter 3: ||f(x)|| = 0.20343809980648603
 Iter 4: ||f(x)|| = 0.12455688975110857
 Iter 5: ||f(x)|| = 0.09737060320458113
 Iter 6: ||f(x)|| = 0.00011468840239103884
 Iter 7: ||f(x)|| = 1.6189005691558123e-10
 Solution: [1.0,359.955]
 Residual value: [0.0,-1.6189e-10]
 Iter 1: ||f(x)|| = 824.0
 Iter 2: ||f(x)|| = 9.859950413066144
 Iter 3: ||f(x)|| = 0.20432256616523486
 Iter 4: ||f(x)|| = 0.12524225006948697
 Iter 5: ||f(x)|| = 0.09817936660510895
 Iter 6: ||f(x)|| = 0.00011660038126137806
 Iter 7: ||f(x)|| = 1.6189005691558123e-10
 Solution: [1.0,359.979]
 Residual value: [0.0,-1.6189e-10]
 Iter 1: ||f(x)|| = 826.0
 Iter 2: ||f(x)|| = 9.883882331546374
 Iter 3: ||f(x)|| = 0.20520661353722408
 Iter 4: ||f(x)|| = 0.12592743468005285
 Iter 5: ||f(x)|| = 0.09898763387445797
 Iter 6: ||f(x)|| = 0.00011852696752612246
 Iter 7: ||f(x)|| = 1.7280399333685637e-10
 Solution: [1.0,360.004]
 Residual value: [0.0,-1.72804e-10]
 Iter 1: ||f(x)|| = 828.0
 Iter 2: ||f(x)|| = 9.907814250021147
 Iter 3: ||f(x)|| = 0.20609023981692726
 Iter 4: ||f(x)|| = 0.12661243781504472
 Iter 5: ||f(x)|| = 0.09979540099084261
 Iter 6: ||f(x)|| = 0.00012046810843457934
 Iter 7: ||f(x)|| = 1.7826096154749393e-10
 Solution: [1.0,360.028]
 Residual value: [0.0,-1.78261e-10]
 Iter 1: ||f(x)|| = 830.0

```

Iter 2: ||f(x)|| = 9.931746168500467
Iter 3: ||f(x)|| = 0.2069734429231393
Iter 4: ||f(x)|| = 0.1272972537863033
Iter 5: ||f(x)|| = 0.10060266402069828
Iter 6: ||f(x)|| = 0.0001224237666974659
Iter 7: ||f(x)|| = 1.837179297581315e-10
Solution: [1.0,360.052]
Residual value: [0.0,-1.83718e-10]
Iter 1: ||f(x)|| = 832.0
Iter 2: ||f(x)|| = 9.955678086979788
Iter 3: ||f(x)|| = 0.20785622079901694
Iter 4: ||f(x)|| = 0.12798187698422678
Iter 5: ||f(x)|| = 0.10140941906411172
Iter 6: ||f(x)|| = 0.00012439391866791993
Iter 7: ||f(x)|| = 1.90084392670542e-10
Solution: [1.0,360.076]
Residual value: [0.0,-1.90084e-10]
Iter 1: ||f(x)|| = 834.0
Iter 2: ||f(x)|| = 9.979610005450922
Iter 3: ||f(x)|| = 0.20873857141209562
Iter 4: ||f(x)|| = 0.12866630187673012
Iter 5: ||f(x)|| = 0.10221566230120516
Iter 6: ||f(x)|| = 0.0001263785025003017
Iter 7: ||f(x)|| = 1.9099388737231493e-10
Solution: [1.0,360.1]
Residual value: [0.0,-1.90994e-10]
Iter 1: ||f(x)|| = 836.0
Iter 2: ||f(x)|| = 10.003541923930243
Iter 3: ||f(x)|| = 0.20962049275432315
Iter 4: ||f(x)|| = 0.12935052300824956
Iter 5: ||f(x)|| = 0.10302138996030408
Iter 6: ||f(x)|| = 0.00012837749636673834
Iter 7: ||f(x)|| = 1.964508555829525e-10
Solution: [1.0,360.125]
Residual value: [0.0,-1.96451e-10]
Iter 1: ||f(x)|| = 838.0
Iter 2: ||f(x)|| = 10.02747384241411
Iter 3: ||f(x)|| = 0.21050198284207794
Iter 4: ||f(x)|| = 0.130034534998737
Iter 5: ||f(x)|| = 0.10382659832794161
Iter 6: ||f(x)|| = 0.00013039084842603188
Iter 7: ||f(x)|| = 2.1191226551309228e-10
Solution: [1.0,360.149]
Residual value: [0.0,-2.11912e-10]
Iter 1: ||f(x)|| = 840.0
Iter 2: ||f(x)|| = 10.05140576089343
Iter 3: ||f(x)|| = 0.21138303971620406
Iter 4: ||f(x)|| = 0.13071833254266751

```



```

Iter 5: ||f(x)|| = 0.10463128375067754
Iter 6: ||f(x)|| = 0.00013241851956991013
Iter 7: ||f(x)|| = 2.0827428670600057e-10
Solution: [1.0,360.173]
Residual value: [0.0,-2.08274e-10]
Iter 1: ||f(x)|| = 842.0
Iter 2: ||f(x)|| = 10.075337679369113
Iter 3: ||f(x)|| = 0.2122636614420212
Iter 4: ||f(x)|| = 0.1314019104081032
Iter 5: ||f(x)|| = 0.10543544262327487
Iter 6: ||f(x)|| = 0.00013446048797050025
Iter 7: ||f(x)|| = 2.191882231272757e-10
Solution: [1.0,360.197]
Residual value: [0.0,-2.19188e-10]
Iter 1: ||f(x)|| = 844.0
Iter 2: ||f(x)|| = 10.099269597843886
Iter 3: ||f(x)|| = 0.21314384610932036
Iter 4: ||f(x)|| = 0.13208526343571086
Iter 5: ||f(x)|| = 0.10623907140143274
Iter 6: ||f(x)|| = 0.0001365166817777208
Iter 7: ||f(x)|| = 2.2464519133791327e-10
Solution: [1.0,360.222]
Residual value: [0.0,-2.24645e-10]
Iter 1: ||f(x)|| = 846.0
Iter 2: ||f(x)|| = 10.123201516328663
Iter 3: ||f(x)|| = 0.21402359183245528
Iter 4: ||f(x)|| = 0.1327683865378601
Iter 5: ||f(x)|| = 0.10704216659087251
Iter 6: ||f(x)|| = 0.00013858708462066716
Iter 7: ||f(x)|| = 2.346496330574155e-10
Solution: [1.0,360.246]
Residual value: [0.0,-2.3465e-10]
Iter 1: ||f(x)|| = 848.0
Iter 2: ||f(x)|| = 10.147133434803436
Iter 3: ||f(x)|| = 0.2149028967502705
Iter 4: ||f(x)|| = 0.1334512746976771
Iter 5: ||f(x)|| = 0.10784472474369977
Iter 6: ||f(x)|| = 0.0001406716464771307
Iter 7: ||f(x)|| = 2.3646862246096134e-10
Solution: [1.0,360.27]
Residual value: [0.0,-2.36469e-10]
Iter 1: ||f(x)|| = 850.0
Iter 2: ||f(x)|| = 10.171065353278209
Iter 3: ||f(x)|| = 0.21578175902617938
Iter 4: ||f(x)|| = 0.1341339229681657
Iter 5: ||f(x)|| = 0.10864674249205564
Iter 6: ||f(x)|| = 0.00014277032732934458
Iter 7: ||f(x)|| = 2.473825588822365e-10

```

Solution: [1.0,360.294]
 Residual value: [0.0,-2.47383e-10]
 Iter 1: ||f(x)|| = 852.0
 Iter 2: ||f(x)|| = 10.19499727175753
 Iter 3: ||f(x)|| = 0.21666017684813518
 Iter 4: ||f(x)|| = 0.13481632647129435
 Iter 5: ||f(x)|| = 0.10944821647990466
 Iter 6: ||f(x)|| = 0.00014488309443549952
 Iter 7: ||f(x)|| = 2.5283952709287405e-10
 Solution: [1.0,360.318]
 Residual value: [0.0,-2.5284e-10]
 Iter 1: ||f(x)|| = 854.0
 Iter 2: ||f(x)|| = 10.21892919023685
 Iter 3: ||f(x)|| = 0.21753814842868158
 Iter 4: ||f(x)|| = 0.13549848039714218
 Iter 5: ||f(x)|| = 0.11024914341487602
 Iter 6: ||f(x)|| = 0.0001470098986828816
 Iter 7: ||f(x)|| = 2.637534635141492e-10
 Solution: [1.0,360.343]
 Residual value: [0.0,-2.63753e-10]
 Iter 1: ||f(x)|| = 856.0
 Iter 2: ||f(x)|| = 10.24286110871708
 Iter 3: ||f(x)|| = 0.21841567200493772
 Iter 4: ||f(x)|| = 0.1361803800030329
 Iter 5: ||f(x)|| = 0.11104952008554392
 Iter 6: ||f(x)|| = 0.0001491507046011975
 Iter 7: ||f(x)|| = 2.646629582159221e-10
 Solution: [1.0,360.367]
 Residual value: [0.0,-2.64663e-10]
 Iter 1: ||f(x)|| = 858.0
 Iter 2: ||f(x)|| = 10.2667930271964
 Iter 3: ||f(x)|| = 0.21929274583860192
 Iter 4: ||f(x)|| = 0.13686202061267222
 Iter 5: ||f(x)|| = 0.11184934326865914
 Iter 6: ||f(x)|| = 0.00015130545943975449
 Iter 7: ||f(x)|| = 2.7557689463719726e-10
 Solution: [1.0,360.391]
 Residual value: [0.0,-2.75577e-10]
 Iter 1: ||f(x)|| = 860.0
 Iter 2: ||f(x)|| = 10.29072494567572
 Iter 3: ||f(x)|| = 0.22016936821598188
 Iter 4: ||f(x)|| = 0.13754339761534576
 Iter 5: ||f(x)|| = 0.11264860985011182
 Iter 6: ||f(x)|| = 0.0001534741350042168
 Iter 7: ||f(x)|| = 2.8558133635669947e-10
 Solution: [1.0,360.415]
 Residual value: [0.0,-2.85581e-10]
 Iter 1: ||f(x)|| = 862.0

```

Iter 2: ||f(x)|| = 10.31465686415595
Iter 3: ||f(x)|| = 0.22104553744797673
Iter 4: ||f(x)|| = 0.13822450646507087
Iter 5: ||f(x)|| = 0.11344731672579655
Iter 6: ||f(x)|| = 0.00015565669036732288
Iter 7: ||f(x)|| = 3.0104274628683925e-10
Solution: [1.0,360.44]
Residual value: [0.0,-3.01043e-10]
Iter 1: ||f(x)|| = 864.0
Iter 2: ||f(x)|| = 10.338588782630723
Iter 3: ||f(x)|| = 0.22192125187010303
Iter 4: ||f(x)|| = 0.1389053426797997
Iter 5: ||f(x)|| = 0.1142454608452681
Iter 6: ||f(x)|| = 0.0001578530736878747
Iter 7: ||f(x)|| = 2.9740476747974753e-10
Solution: [1.0,360.464]
Residual value: [0.0,-2.97405e-10]
Iter 1: ||f(x)|| = 866.0
Iter 2: ||f(x)|| = 10.362520701105495
Iter 3: ||f(x)|| = 0.22279650984248106
Iter 4: ||f(x)|| = 0.13958590184062247
Iter 5: ||f(x)|| = 0.1150430392144699
Iter 6: ||f(x)|| = 0.00016006324949557893
Iter 7: ||f(x)|| = 3.119566827081144e-10
Solution: [1.0,360.488]
Residual value: [0.0,-3.11957e-10]
Iter 1: ||f(x)|| = 868.0
Iter 2: ||f(x)|| = 10.386452619590273
Iter 3: ||f(x)|| = 0.22367130974983152
Iter 4: ||f(x)|| = 0.1402661795909942
Iter 5: ||f(x)|| = 0.11584004887572519
Iter 6: ||f(x)|| = 0.00016228717413468985
Iter 7: ||f(x)|| = 3.1741365091875196e-10
Solution: [1.0,360.512]
Residual value: [0.0,-3.17414e-10]
Iter 1: ||f(x)|| = 870.0
Iter 2: ||f(x)|| = 10.410384538060498
Iter 3: ||f(x)|| = 0.22454565000149954
Iter 4: ||f(x)|| = 0.14094617163596154
Iter 5: ||f(x)|| = 0.11663648691046546
Iter 6: ||f(x)|| = 0.00016452482304885052
Iter 7: ||f(x)|| = 3.283275873400271e-10
Solution: [1.0,360.536]
Residual value: [0.0,-3.28328e-10]
Iter 1: ||f(x)|| = 872.0
Iter 2: ||f(x)|| = 10.434316456544366
Iter 3: ||f(x)|| = 0.22541952903142565
Iter 4: ||f(x)|| = 0.14162587374139238

```

```

Iter 5: ||f(x)|| = 0.11743235044468747
Iter 6: ||f(x)|| = 0.00016677613439242123
Iter 7: ||f(x)|| = 3.4378899727016687e-10
Solution: [1.0,360.561]
Residual value: [0.0,-3.43789e-10]
Iter 1: ||f(x)|| = 874.0
Iter 2: ||f(x)|| = 10.458248375024596
Iter 3: ||f(x)|| = 0.22629294529815033
Iter 4: ||f(x)|| = 0.14230528173324555
Iter 5: ||f(x)|| = 0.11822763667078107
Iter 6: ||f(x)|| = 0.00016904106723814039
Iter 7: ||f(x)|| = 3.3924152376130223e-10
Solution: [1.0,360.585]
Residual value: [0.0,-3.39242e-10]
Iter 1: ||f(x)|| = 876.0
Iter 2: ||f(x)|| = 10.482180293503916
Iter 3: ||f(x)|| = 0.22716589728482892
Iter 4: ||f(x)|| = 0.14298439149683834
Iter 5: ||f(x)|| = 0.1190223427820456
Iter 6: ||f(x)|| = 0.00017131959521066165
Iter 7: ||f(x)|| = 3.5015546018257737e-10
Solution: [1.0,360.609]
Residual value: [0.0,-3.50155e-10]
Iter 1: ||f(x)|| = 878.0
Iter 2: ||f(x)|| = 10.506112211978689
Iter 3: ||f(x)|| = 0.22803838349918829
Iter 4: ||f(x)|| = 0.14366319897611485
Iter 5: ||f(x)|| = 0.1198164660772818
Iter 6: ||f(x)|| = 0.00017361165737384
Iter 7: ||f(x)|| = 3.6561687011271715e-10
Solution: [1.0,360.633]
Residual value: [0.0,-3.65617e-10]
Iter 1: ||f(x)|| = 880.0
Iter 2: ||f(x)|| = 10.530044130458009
Iter 3: ||f(x)|| = 0.22891040247355487
Iter 4: ||f(x)|| = 0.14434170017292486
Iter 5: ||f(x)|| = 0.12061000382072962
Iter 6: ||f(x)|| = 0.00017591722189536085
Iter 7: ||f(x)|| = 3.728928277269006e-10
Solution: [1.0,360.658]
Residual value: [0.0,-3.72893e-10]
Iter 1: ||f(x)|| = 882.0
Iter 2: ||f(x)|| = 10.553976048932782
Iter 3: ||f(x)|| = 0.22978195276481864
Iter 4: ||f(x)|| = 0.14501989114636507
Iter 5: ||f(x)|| = 0.12140295335393603
Iter 6: ||f(x)|| = 0.00017823624784796266
Iter 7: ||f(x)|| = 3.774403012357652e-10

```

Solution: [1.0,360.682]
 Residual value: [0.0,-3.7744e-10]
 Iter 1: ||f(x)|| = 884.0
 Iter 2: ||f(x)|| = 10.577907967413012
 Iter 3: ||f(x)|| = 0.23065303295442782
 Iter 4: ||f(x)|| = 0.14569776801202947
 Iter 5: ||f(x)|| = 0.12219531209211709
 Iter 6: ||f(x)|| = 0.00018056870248983614
 Iter 7: ||f(x)|| = 3.9835867937654257e-10
 Solution: [1.0,360.706]
 Residual value: [0.0,-3.98359e-10]
 Iter 1: ||f(x)|| = 886.0
 Iter 2: ||f(x)|| = 10.601839885892332
 Iter 3: ||f(x)|| = 0.23152364164840003
 Iter 4: ||f(x)|| = 0.14637532694138505
 Iter 5: ||f(x)|| = 0.12298707741956605
 Iter 6: ||f(x)|| = 0.00018291452306584688
 Iter 7: ||f(x)|| = 4.029061528854072e-10
 Solution: [1.0,360.73]
 Residual value: [0.0,-4.02906e-10]
 Iter 1: ||f(x)|| = 888.0
 Iter 2: ||f(x)|| = 10.625771804371652
 Iter 3: ||f(x)|| = 0.2323937774772718
 Iter 4: ||f(x)|| = 0.14705256416106732
 Iter 5: ||f(x)|| = 0.1237782468124351
 Iter 6: ||f(x)|| = 0.000185273669558228
 Iter 7: ||f(x)|| = 4.1745806811377406e-10
 Solution: [1.0,360.754]
 Residual value: [0.0,-4.17458e-10]
 Iter 1: ||f(x)|| = 890.0
 Iter 2: ||f(x)|| = 10.64970372285643
 Iter 3: ||f(x)|| = 0.2332634390961045
 Iter 4: ||f(x)|| = 0.14772947595224872
 Iter 5: ||f(x)|| = 0.1245688177732518
 Iter 6: ||f(x)|| = 0.00018764612741506426
 Iter 7: ||f(x)|| = 4.2018655221909285e-10
 Solution: [1.0,360.779]
 Residual value: [0.0,-4.20187e-10]
 Iter 1: ||f(x)|| = 892.0
 Iter 2: ||f(x)|| = 10.673635641326655
 Iter 3: ||f(x)|| = 0.23413262518447228
 Iter 4: ||f(x)|| = 0.14840605864996986
 Iter 5: ||f(x)|| = 0.1253587878200051
 Iter 6: ||f(x)|| = 0.00019003182114829542
 Iter 7: ||f(x)|| = 4.3928594095632434e-10
 Solution: [1.0,360.803]
 Residual value: [0.0,-4.39286e-10]
 Iter 1: ||f(x)|| = 894.0

```

Iter 2: ||f(x)|| = 10.697567559806885
Iter 3: ||f(x)|| = 0.23500133444642476
Iter 4: ||f(x)|| = 0.14908230864249966
Iter 5: ||f(x)|| = 0.12614815454344352
Iter 6: ||f(x)|| = 0.00019243072620156454
Iter 7: ||f(x)|| = 4.48459713808802e-10
Solution: [1.0,360.827]
Residual value: [-4.4846e-10,-4.45652e-10]
Iter 1: ||f(x)|| = 896.0
Iter 2: ||f(x)|| = 10.721499478280748
Iter 3: ||f(x)|| = 0.23586956561049044
Iter 4: ||f(x)|| = 0.14975822237073316
Iter 5: ||f(x)|| = 0.12693691555159603
Iter 6: ||f(x)|| = 0.00019484279822046258
Iter 7: ||f(x)|| = 3.7962308852002025e-8
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,360.851]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 898.0
Iter 2: ||f(x)|| = 10.745431396765525
Iter 3: ||f(x)|| = 0.23673731742962123
Iter 4: ||f(x)|| = 0.15043379632755138
Iter 5: ||f(x)|| = 0.1277250684761384
Iter 6: ||f(x)|| = 0.00019726798836927628
Iter 7: ||f(x)|| = 4.720277502201498e-10
Solution: [1.0,360.876]
Residual value: [0.0,-4.72028e-10]
Iter 1: ||f(x)|| = 900.0
Iter 2: ||f(x)|| = 10.769363315244846
Iter 3: ||f(x)|| = 0.23760458868121692
Iter 4: ||f(x)|| = 0.15110902705720033
Iter 5: ||f(x)|| = 0.128512611023325
Iter 6: ||f(x)|| = 0.00019970626908616396
Iter 7: ||f(x)|| = 4.82032191939652e-10
Solution: [1.0,360.9]
Residual value: [0.0,-4.82032e-10]
Iter 1: ||f(x)|| = 902.0
Iter 2: ||f(x)|| = 10.793295233711433
Iter 3: ||f(x)|| = 0.23847137816706795
Iter 4: ||f(x)|| = 0.1517839111547353
Iter 5: ||f(x)|| = 0.1292995408812203
Iter 6: ||f(x)|| = 0.00020215758377162274
Iter 7: ||f(x)|| = 5.020410753786564e-10
Solution: [1.0,360.924]
Residual value: [0.0,-5.02041e-10]
Iter 1: ||f(x)|| = 904.0
Iter 2: ||f(x)|| = 10.817227152199848
Iter 3: ||f(x)|| = 0.23933768471333428

```

```

Iter 4: ||f(x)|| = 0.15245844526537092
Iter 5: ||f(x)|| = 0.1300858558361142
Iter 6: ||f(x)|| = 0.00020462188967940165
Iter 7: ||f(x)|| = 5.07498043589294e-10
Solution: [1.0,360.948]
Residual value: [0.0,-5.07498e-10]
Iter 1: ||f(x)|| = 906.0
Iter 2: ||f(x)|| = 10.841159070673712
Iter 3: ||f(x)|| = 0.2402035071705358
Iter 4: ||f(x)|| = 0.1531326260839448
Iter 5: ||f(x)|| = 0.1308715536561067
Iter 6: ||f(x)|| = 0.00020709915497718612
Iter 7: ||f(x)|| = 5.229594535194337e-10
Solution: [1.0,360.972]
Residual value: [0.0,-5.22959e-10]
Iter 1: ||f(x)|| = 908.0
Iter 2: ||f(x)|| = 10.865090989150303
Iter 3: ||f(x)|| = 0.2410688444134944
Iter 4: ||f(x)|| = 0.15380645035432383
Iter 5: ||f(x)|| = 0.13165663215204404
Iter 6: ||f(x)|| = 0.00020958933691872517
Iter 7: ||f(x)|| = 5.338733899407089e-10
Solution: [1.0,360.997]
Residual value: [0.0,-5.33873e-10]
Iter 1: ||f(x)|| = 910.0
Iter 2: ||f(x)|| = 10.889022907638719
Iter 3: ||f(x)|| = 0.24193369534133521
Iter 4: ||f(x)|| = 0.1544799148688397
Iter 5: ||f(x)|| = 0.13244108920389408
Iter 6: ||f(x)|| = 0.00021209237911534728
Iter 7: ||f(x)|| = 5.438778316602111e-10
Solution: [1.0,361.021]
Residual value: [0.0,-5.43878e-10]
Iter 1: ||f(x)|| = 912.0
Iter 2: ||f(x)|| = 10.912954826112582
Iter 3: ||f(x)|| = 0.242798058877442
Iter 4: ||f(x)|| = 0.1551530164677406
Iter 5: ||f(x)|| = 0.1332249226716158
Iter 6: ||f(x)|| = 0.00021460824767360887
Iter 7: ||f(x)|| = 4.604681791420262e-8
Iter 8: ||f(x)|| = 0.0
Solution: [1.0,361.045]
Residual value: [0.0,0.0]
Iter 1: ||f(x)|| = 914.0
Iter 2: ||f(x)|| = 10.936886744592812
Iter 3: ||f(x)|| = 0.24366193396943014
Iter 4: ||f(x)|| = 0.15582575203863003
Iter 5: ||f(x)|| = 0.13400813049793214

```

```

Iter 6: ||f(x)|| = 0.00021713690421165666
Iter 7: ||f(x)|| = 5.684341886080801e-10
Solution: [1.0,361.069]
Residual value: [0.0,-5.68434e-10]
Iter 1: ||f(x)|| = 916.0
Iter 2: ||f(x)|| = 10.960818663063947
Iter 3: ||f(x)|| = 0.24452531958910256
Iter 4: ||f(x)|| = 0.15649111906489
Iter 5: ||f(x)|| = 0.021175666585302455
Iter 6: ||f(x)|| = 0.00043911039990918166
Iter 7: ||f(x)|| = 1.9273920770501718e-7
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [1.0,361.094]
Residual value: [0.0,-2.72848e-12]
Iter 1: ||f(x)|| = 918.0
Iter 2: ||f(x)|| = 10.984750581547814
Iter 3: ||f(x)|| = 0.24538821473242578
Iter 4: ||f(x)|| = 0.15558193409213628
Iter 5: ||f(x)|| = 0.020946795291384324
Iter 6: ||f(x)|| = 0.00042976601798727643
Iter 7: ||f(x)|| = 1.8462105799699202e-7
Iter 8: ||f(x)|| = 3.637978807091713e-12
Solution: [1.0,361.118]
Residual value: [0.0,-3.63798e-12]
Iter 1: ||f(x)|| = 920.0
Iter 2: ||f(x)|| = 11.008682500028044
Iter 3: ||f(x)|| = 0.24625061841949342
Iter 4: ||f(x)|| = 0.15467596454978372
Iter 5: ||f(x)|| = 0.020719799099424563
Iter 6: ||f(x)|| = 0.0004205954228382325
Iter 7: ||f(x)|| = 1.768275978974998e-7
Iter 8: ||f(x)|| = 0.0
Solution: [1.0,361.142]
Residual value: [0.0,0.0]
Iter 1: ||f(x)|| = 922.0
Iter 2: ||f(x)|| = 11.032614418501907
Iter 3: ||f(x)|| = 0.24711252969448377
Iter 4: ||f(x)|| = 0.1537731906540205
Iter 5: ||f(x)|| = 0.02049466425251012
Iter 6: ||f(x)|| = 0.0004115957461610087
Iter 7: ||f(x)|| = 1.6934135804724804e-7
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,361.166]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 924.0
Iter 2: ||f(x)|| = 11.056546336982137
Iter 3: ||f(x)|| = 0.2479739476256275
Iter 4: ||f(x)|| = 0.15287359295321223

```



```

Iter 5: ||f(x)|| = 0.020271377166864113
Iter 6: ||f(x)|| = 0.00040276415165863
Iter 7: ||f(x)|| = 1.6215365072902443e-7
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [1.0,361.19]
Residual value: [0.0,2.72848e-12]
Iter 1: ||f(x)|| = 926.0
Iter 2: ||f(x)|| = 11.08047825545691
Iter 3: ||f(x)|| = 0.2488348713051577
Iter 4: ||f(x)|| = 0.15197715232268183
Iter 5: ||f(x)|| = 0.02004992441173159
Iter 6: ||f(x)|| = 0.0003940978403988993
Iter 7: ||f(x)|| = 1.5525347407674417e-7
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,361.215]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 928.0
Iter 2: ||f(x)|| = 11.104410173940778
Iter 3: ||f(x)|| = 0.24969529984928968
Iter 4: ||f(x)|| = 0.15108384995971014
Iter 5: ||f(x)|| = 0.01983029275197623
Iter 6: ||f(x)|| = 0.00038559406725224843
Iter 7: ||f(x)|| = 1.486278051743284e-7
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,361.239]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 930.0
Iter 2: ||f(x)|| = 11.128342092411003
Iter 3: ||f(x)|| = 0.25055523239815225
Iter 4: ||f(x)|| = 0.15076380742266338
Iter 5: ||f(x)|| = 0.01967716485232196
Iter 6: ||f(x)|| = 0.00037971902474964736
Iter 7: ||f(x)|| = 1.441321728634648e-7
Iter 8: ||f(x)|| = 3.637978807091713e-12
Solution: [1.0,361.263]
Residual value: [0.0,3.63798e-12]
Iter 1: ||f(x)|| = 932.0
Iter 2: ||f(x)|| = 11.152274010894871
Iter 3: ||f(x)|| = 0.25141466811575697
Iter 4: ||f(x)|| = 0.15130045232399425
Iter 5: ||f(x)|| = 0.019621423772150592
Iter 6: ||f(x)|| = 0.00037759139650006546
Iter 7: ||f(x)|| = 1.425232767360285e-7
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [1.0,361.287]
Residual value: [0.0,2.72848e-12]
Iter 1: ||f(x)|| = 934.0
Iter 2: ||f(x)|| = 11.176205929370553

```

```

Iter 3: ||f(x)|| = 0.2522736061899686
Iter 4: ||f(x)|| = 0.15183644077842473
Iter 5: ||f(x)|| = 0.01956524109956792
Iter 6: ||f(x)|| = 0.00037545283521467354
Iter 7: ||f(x)|| = 1.4091529010329396e-7
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,361.312]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 936.0
Iter 2: ||f(x)|| = 11.200137847849874
Iter 3: ||f(x)|| = 0.2531320458324249
Iter 4: ||f(x)|| = 0.15237177304970828
Iter 5: ||f(x)|| = 0.019508620904161944
Iter 6: ||f(x)|| = 0.0003733036499384834
Iter 7: ||f(x)|| = 1.3930361231206945e-7
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,361.336]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 938.0
Iter 2: ||f(x)|| = 11.224069766324646
Iter 3: ||f(x)|| = 0.25398998627852404
Iter 4: ||f(x)|| = 0.15290644942160725
Iter 5: ||f(x)|| = 0.019451567170885475
Iter 6: ||f(x)|| = 0.00037114413042038663
Iter 7: ||f(x)|| = 1.37696860136316e-7
Iter 8: ||f(x)|| = 1.8189894035458565e-12
Solution: [1.0,361.36]
Residual value: [0.0,-1.81899e-12]
Iter 1: ||f(x)|| = 940.0
Iter 2: ||f(x)|| = 11.248001684809424
Iter 3: ||f(x)|| = 0.25484742678734934
Iter 4: ||f(x)|| = 0.15344047018879792
Iter 5: ||f(x)|| = 0.019394083956393304
Iter 6: ||f(x)|| = 0.0003689745726660476
Iter 7: ||f(x)|| = 1.3609223969979212e-7
Iter 8: ||f(x)|| = 1.8189894035458565e-12
Solution: [1.0,361.384]
Residual value: [0.0,1.81899e-12]
Iter 1: ||f(x)|| = 942.0
Iter 2: ||f(x)|| = 11.271933603288744
Iter 3: ||f(x)|| = 0.2557043666416404
Iter 4: ||f(x)|| = 0.1539738356750604
Iter 5: ||f(x)|| = 0.019336175262651523
Iter 6: ||f(x)|| = 0.0003667952562831367
Iter 7: ||f(x)|| = 1.344894299259991e-7
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [1.0,361.408]
Residual value: [0.0,-2.72848e-12]

```

```

Iter 1: ||f(x)|| = 944.0
Iter 2: ||f(x)|| = 11.295865521768974
Iter 3: ||f(x)|| = 0.25656080514772617
Iter 4: ||f(x)|| = 0.15450654621872673
Iter 5: ||f(x)|| = 0.01927784506460739
Iter 6: ||f(x)|| = 0.0003646064830277185
Iter 7: ||f(x)|| = 1.3288943512268503e-7
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,361.433]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 946.0
Iter 2: ||f(x)|| = 11.319797440243747
Iter 3: ||f(x)|| = 0.2574167416354892
Iter 4: ||f(x)|| = 0.15503860215721943
Iter 5: ||f(x)|| = 0.019219097365275273
Iter 6: ||f(x)|| = 0.00036240853854752064
Iter 7: ||f(x)|| = 1.3129236731135308e-7
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,361.457]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 948.0
Iter 2: ||f(x)|| = 11.343729358727614
Iter 3: ||f(x)|| = 0.2582721754582995
Iter 4: ||f(x)|| = 0.1555700038870782
Iter 5: ||f(x)|| = 0.019159936137382427
Iter 6: ||f(x)|| = 0.0003602017110088118
Iter 7: ||f(x)|| = 1.296994014410302e-7
Iter 8: ||f(x)|| = 1.8189894035458565e-12
Solution: [1.0,361.481]
Residual value: [0.0,-1.81899e-12]
Iter 1: ||f(x)|| = 950.0
Iter 2: ||f(x)|| = 11.36766127719784
Iter 3: ||f(x)|| = 0.2591271059929565
Iter 4: ||f(x)|| = 0.1561007517748294
Iter 5: ||f(x)|| = 0.019100365348094783
Iter 6: ||f(x)|| = 0.00035798628778138664
Iter 7: ||f(x)|| = 1.2810832106247005e-7
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [1.0,361.505]
Residual value: [0.0,-2.72848e-12]
Iter 1: ||f(x)|| = 952.0
Iter 2: ||f(x)|| = 11.39159319567716
Iter 3: ||f(x)|| = 0.25998153263965695
Iter 4: ||f(x)|| = 0.1566308462570305
Iter 5: ||f(x)|| = 0.019040388935304353
Iter 6: ||f(x)|| = 0.0003557625534218456
Iter 7: ||f(x)|| = 1.2652198277951499e-7
Iter 8: ||f(x)|| = 9.094947017729282e-13

```

Solution: [1.0,361.53]
 Residual value: [0.0,9.09495e-13]
 Iter 1: ||f(x)|| = 954.0
 Iter 2: ||f(x)|| = 11.415525114151933
 Iter 3: ||f(x)|| = 0.26083545482191167
 Iter 4: ||f(x)|| = 0.15716028771930723
 Iter 5: ||f(x)|| = 0.018980010860104812
 Iter 6: ||f(x)|| = 0.0003535308023856487
 Iter 7: ||f(x)|| = 1.249398552394254e-7
 Iter 8: ||f(x)|| = 9.094947017729282e-13
 Solution: [1.0,361.554]
 Residual value: [0.0,-9.09495e-13]
 Iter 1: ||f(x)|| = 956.0
 Iter 2: ||f(x)|| = 11.439457032631253
 Iter 3: ||f(x)|| = 0.26168887198650115
 Iter 4: ||f(x)|| = 0.1576890766291399
 Iter 5: ||f(x)|| = 0.018919235052635486
 Iter 6: ||f(x)|| = 0.0003512912935548229
 Iter 7: ||f(x)|| = 1.2336295185377821e-7
 Iter 8: ||f(x)|| = 9.094947017729282e-13
 Solution: [1.0,361.578]
 Residual value: [0.0,-9.09495e-13]
 Iter 1: ||f(x)|| = 958.0
 Iter 2: ||f(x)|| = 11.463388951111483
 Iter 3: ||f(x)|| = 0.2625417836034282
 Iter 4: ||f(x)|| = 0.1582172134421853
 Iter 5: ||f(x)|| = 0.018858065420137904
 Iter 6: ||f(x)|| = 0.0003490443305697033
 Iter 7: ||f(x)|| = 1.2178943487040073e-7
 Iter 8: ||f(x)|| = 2.7284841053187847e-12
 Solution: [1.0,361.602]
 Residual value: [0.0,-2.72848e-12]
 Iter 1: ||f(x)|| = 960.0
 Iter 2: ||f(x)|| = 11.487320869590803
 Iter 3: ||f(x)|| = 0.26339418916582535
 Iter 4: ||f(x)|| = 0.1587446986204668
 Iter 5: ||f(x)|| = 0.018796505899445037
 Iter 6: ||f(x)|| = 0.00034679019063332817
 Iter 7: ||f(x)|| = 1.2022174444847877e-7
 Iter 8: ||f(x)|| = 9.094947017729282e-13
 Solution: [1.0,361.626]
 Residual value: [0.0,9.09495e-13]
 Iter 1: ||f(x)|| = 962.0
 Iter 2: ||f(x)|| = 11.511252788066486
 Iter 3: ||f(x)|| = 0.26424608818993245
 Iter 4: ||f(x)|| = 0.15927153266602545
 Iter 5: ||f(x)|| = 0.018734560386292287
 Iter 6: ||f(x)|| = 0.0003445291558819008

```

Iter 7: ||f(x)|| = 1.1866450222441927e-7
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,361.651]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 964.0
Iter 2: ||f(x)|| = 11.535184706549444
Iter 3: ||f(x)|| = 0.2650974802149999
Iter 4: ||f(x)|| = 0.15979771607180737
Iter 5: ||f(x)|| = 0.018672232756216545
Iter 6: ||f(x)|| = 0.0003422614898667131
Iter 7: ||f(x)|| = 1.171028478630376e-7
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [1.0,361.675]
Residual value: [0.0,2.72848e-12]
Iter 1: ||f(x)|| = 966.0
Iter 2: ||f(x)|| = 11.559116625026036
Iter 3: ||f(x)|| = 0.265948364803254
Iter 4: ||f(x)|| = 0.1603232493798714
Iter 5: ||f(x)|| = 0.018609526920045028
Iter 6: ||f(x)|| = 0.0003399874876777176
Iter 7: ||f(x)|| = 1.1555220480463646e-7
Iter 8: ||f(x)|| = 1.8189894035458565e-12
Solution: [1.0,361.699]
Residual value: [0.0,1.81899e-12]
Iter 1: ||f(x)|| = 968.0
Iter 2: ||f(x)|| = 11.583048543505356
Iter 3: ||f(x)|| = 0.2667987415398203
Iter 4: ||f(x)|| = 0.16084813311317703
Iter 5: ||f(x)|| = 0.018546446735056232
Iter 6: ||f(x)|| = 0.0003377074172021821
Iter 7: ||f(x)|| = 1.1401152733014897e-7
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,361.723]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 970.0
Iter 2: ||f(x)|| = 11.606980461980129
Iter 3: ||f(x)|| = 0.26764861003265855
Iter 4: ||f(x)|| = 0.16137236782651598
Iter 5: ||f(x)|| = 0.01848299607604742
Iter 6: ||f(x)|| = 0.0003354215487773038
Iter 7: ||f(x)|| = 1.1247266229474917e-7
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,361.748]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 972.0
Iter 2: ||f(x)|| = 11.63091238045945
Iter 3: ||f(x)|| = 0.26849796991248664
Iter 4: ||f(x)|| = 0.16189595407013257

```

```

Iter 5: ||f(x)|| = 0.01841917879332411
Iter 6: ||f(x)|| = 0.0003331301641082973
Iter 7: ||f(x)|| = 1.1094380170106888e-7
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,361.772]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 974.0
Iter 2: ||f(x)|| = 11.654844298934222
Iter 3: ||f(x)|| = 0.2693468208327481
Iter 4: ||f(x)|| = 0.1624188924461123
Iter 5: ||f(x)|| = 0.018354998735272132
Iter 6: ||f(x)|| = 0.00033083352955520784
Iter 7: ||f(x)|| = 1.094146263591611e-7
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [1.0,361.796]
Residual value: [0.0,-2.72848e-12]
Iter 1: ||f(x)|| = 976.0
Iter 2: ||f(x)|| = 11.678776217419
Iter 3: ||f(x)|| = 0.2701951624694935
Iter 4: ||f(x)|| = 0.1629411835292558
Iter 5: ||f(x)|| = 0.018290459738636855
Iter 6: ||f(x)|| = 0.0003285319176080659
Iter 7: ||f(x)|| = 1.0789777304953674e-7
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,361.82]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 978.0
Iter 2: ||f(x)|| = 11.702708135893772
Iter 3: ||f(x)|| = 0.2710429945213578
Iter 4: ||f(x)|| = 0.163462827935291
Iter 5: ||f(x)|| = 0.01822556562691291
Iter 6: ||f(x)|| = 0.0003262256022935617
Iter 7: ||f(x)|| = 1.0638843517263297e-7
Iter 8: ||f(x)|| = 0.0
Solution: [1.0,361.844]
Residual value: [0.0,0.0]
Iter 1: ||f(x)|| = 980.0
Iter 2: ||f(x)|| = 11.726640054373092
Iter 3: ||f(x)|| = 0.27189031670946384
Iter 4: ||f(x)|| = 0.16398382628813124
Iter 5: ||f(x)|| = 0.018160320230890648
Iter 6: ||f(x)|| = 0.00032391483365667995
Iter 7: ||f(x)|| = 1.0488684498710654e-7
Iter 8: ||f(x)|| = 1.8189894035458565e-12
Solution: [1.0,361.869]
Residual value: [0.0,-1.81899e-12]
Iter 1: ||f(x)|| = 982.0
Iter 2: ||f(x)|| = 11.750571972852413

```

```

Iter 3: ||f(x)|| = 0.2727371287773545
Iter 4: ||f(x)|| = 0.16450417922624183
Iter 5: ||f(x)|| = 0.018094727341122052
Iter 6: ||f(x)|| = 0.0003215998950821808
Iter 7: ||f(x)|| = 1.0339324141295236e-7
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [1.0,361.893]
Residual value: [0.0,2.72848e-12]
Iter 1: ||f(x)|| = 984.0
Iter 2: ||f(x)|| = 11.774503891332643
Iter 3: ||f(x)|| = 0.273583430490933
Iter 4: ||f(x)|| = 0.16502388738445006
Iter 5: ||f(x)|| = 0.01802879076967656
Iter 6: ||f(x)|| = 0.00031928104543732516
Iter 7: ||f(x)|| = 1.0191070032306015e-7
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,361.917]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 986.0
Iter 2: ||f(x)|| = 11.798435809811963
Iter 3: ||f(x)|| = 0.2744292216383786
Iter 4: ||f(x)|| = 0.16554295143214404
Iter 5: ||f(x)|| = 0.017962514308541788
Iter 6: ||f(x)|| = 0.0003169585479554371
Iter 7: ||f(x)|| = 1.0043088882749629e-7
Iter 8: ||f(x)|| = 4.547473508864641e-12
Solution: [1.0,361.941]
Residual value: [0.0,-4.54747e-12]
Iter 1: ||f(x)|| = 988.0
Iter 2: ||f(x)|| = 11.822367728287645
Iter 3: ||f(x)|| = 0.2752745020300638
Iter 4: ||f(x)|| = 0.16606137203962135
Iter 5: ||f(x)|| = 0.017895901739828135
Iter 6: ||f(x)|| = 0.00031463266714126803
Iter 7: ||f(x)|| = 9.89625773550884e-8
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,361.966]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 990.0
Iter 2: ||f(x)|| = 11.846299646762418
Iter 3: ||f(x)|| = 0.27611927149850907
Iter 4: ||f(x)|| = 0.16657914989536948
Iter 5: ||f(x)|| = 0.0178289568370793
Iter 6: ||f(x)|| = 0.00031230365353940304
Iter 7: ||f(x)|| = 9.750601748237386e-8
Iter 8: ||f(x)|| = 2.7284841053187847e-12
Solution: [1.0,361.99]
Residual value: [0.0,-2.72848e-12]

```

```

Iter 1: ||f(x)|| = 992.0
Iter 2: ||f(x)|| = 11.870231565247195
Iter 3: ||f(x)|| = 0.2769635298982929
Iter 4: ||f(x)|| = 0.1670962856960614
Iter 5: ||f(x)|| = 0.017761683365567493
Iter 6: ||f(x)|| = 0.00030997177545077914
Iter 7: ||f(x)|| = 9.605272788260066e-8
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,362.014]
Residual value: [0.0,9.09495e-13]
Iter 1: ||f(x)|| = 994.0
Iter 2: ||f(x)|| = 11.894163483721968
Iter 3: ||f(x)|| = 0.2778072771059391
Iter 4: ||f(x)|| = 0.16761278014746495
Iter 5: ||f(x)|| = 0.017694085081647937
Iter 6: ||f(x)|| = 0.00030763728655403
Iter 7: ||f(x)|| = 9.461159389267948e-8
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,362.038]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 996.0
Iter 2: ||f(x)|| = 11.918095402195831
Iter 3: ||f(x)|| = 0.2786505130199103
Iter 4: ||f(x)|| = 0.16812863398899935
Iter 5: ||f(x)|| = 0.01762616573523701
Iter 6: ||f(x)|| = 0.000305300445688772
Iter 7: ||f(x)|| = 9.317991311874607e-8
Iter 8: ||f(x)|| = 9.094947017729282e-13
Solution: [1.0,362.062]
Residual value: [0.0,-9.09495e-13]
Iter 1: ||f(x)|| = 998.0
Iter 2: ||f(x)|| = 11.942027320680609
Iter 3: ||f(x)|| = 0.27949323756047584
Iter 4: ||f(x)|| = 0.16864384791824705
Iter 5: ||f(x)|| = 0.017557929063514166
Iter 6: ||f(x)|| = 0.0003029614965116556
Iter 7: ||f(x)|| = 9.175786930271101e-8
Iter 8: ||f(x)|| = 1.8189894035458565e-12
Solution: [1.0,362.087]
Residual value: [0.0,-1.81899e-12]
Iter 1: ||f(x)|| = 1000.0
Iter 2: ||f(x)|| = 11.965959239155382
Iter 3: ||f(x)|| = 0.28033545066964666
Iter 4: ||f(x)|| = 0.16915842272646842
Iter 5: ||f(x)|| = 0.017489378798373645
Iter 6: ||f(x)|| = 0.00030062070254643913
Iter 7: ||f(x)|| = 9.034647519001737e-8
Iter 8: ||f(x)|| = 9.094947017729282e-13

```


Solution: [1.0,362.111]
Residual value: [0.0,9.09495e-13]

```
In [59]: plot(data[:,1],data[:,2])  
        xlabel("Heat Duty (W)");  
        ylabel("Vapor Fraction");  
        axis([0, 1000, -0.05, 1.05]);
```

