NUR Assignment 1

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Abstract

In this document an example solution template is given for the exercises in the course Numerical recipes for astrophysics.

1 Exercise 1

For this first exercise we had to write our own Poisson probability distribution function and random number generator. The output of the Poisson function can be seen in the printed text (see below) and the tests for the rng can be found in 1 and 2.

1.1 Scripts

The functions that I wrote for this exercise can be found in:

```python
#NR_a1_1_utils.py
import numpy as np
import sys
import math # Only used for math.isnan() in NewRaph_rootfinder()

def poisson_distribution(mean,k):
    fact = np.float(0)
    for i in range(round(k)):
        fact += np.log(k-1)
    fact = np.exp(fact)
    return (mean**k*np.exp(-mean))/fact

def poisson_distribution_new(mean,k):
#Returns probability for given k and mean
    fact = 1
    mag = 0
    prev_n = 0
    for i in range(round(k)):
        temp = str(fact*(k-i))
        n_zeros = len(temp)-1-prev_n
        fact = int(temp[:10])
        mag += n_zeros
        prev_n = len(temp[:10])-1

    a = str(mean**k)
    b = str(np.exp(mean))

    x = (float(a[:10])/1e9 * 1/float(b[:10])/(fact/10**(prev_n-1)))
    mag_tot = -int(np.log10(float(b)))+len(a)-mag
    return x*10**mag_tot
# Only works for massive numbers.......
#end poisson_distribution()

class rng(object):
# rng object that is initiated with a give seed
    def __init__(self, seed):
        self.state = np.int64(seed)

    def LCG_gen(self):
```

```python
      #Linear Congruential generator
          x = self.state
          a,c,m = 2**32,1664525,1013904223
          self.state = np.int64((a*x+c)%m)
      #end LCG_gen()

      def XOR_shift(self):
      # XOR-shift generator
          x = self.state
          a1,a2,a3 = 21,35,4
          x = x ^ x >> a1
          x = x ^ x << a2
          x = x ^ x >> a3
          self.state = np.int64(x)
      #end XOR-shift()

      def rand_num(self,l,min=0,max=1):
      # Generates 'l' random numbers between min and max
          output = []
          for i in range(l):
              self.XOR_shift()
              self.XOR_shift()
              self.LCG_gen()
              self.XOR_shift()
              self.XOR_shift()
              output.append(self.state)
          output = np.array(output)/sys.maxsize
          return min+(output*(max-min))
      #end rand_num()
#end rng()

# --- Simple supporting functions ---

def min(l):
    min = 2**64
    for i in l:
        if i < min:
            min = i
    return min
#end min()

def arg_min(l):
    min = 2**64
    arg = None
    for i in range(len(l)):
        if l[i] < min:
            min = l[i]
            arg = i
    return arg
#end arg_min()

def max(l):
    max = -2**64
    for i in l:
        if i > max:
            max = i
    return max
#end max()

def arg_max(l):
    max = -2**64
    arg = None
    for i in range(len(l)):
        if l[i] > max:
            max = l[i]
            arg = i
    return arg
#end arg_max()
```

NR_a1_1_utils.py

The commands used to retrieve the desired results are given by:

```python
#NR_a1_1_main.py
import numpy as np
import matplotlib.pyplot as plt
import NR_a1_1_utils as utils

seed = 42
print('Original seed:',seed)

#---- 1.a ----
# Poisson distribution
print('1.a:')
a1 = [[1,0],[5,10],[3,20],[2.6,40]]
print('Simple poisson distribution:')
for i in range(len(a1)):
    print('P({}) with mean {}:'.format(a1[i][1],a1[i][0]),utils.poisson_distribution(a1[
        i][0],a1[i][1]))
print('Large-number poisson distribution (only works for large numbers):')
a1 = [[101,200]]
for i in range(len(a1)):
    print('P({}) with mean {}:'.format(a1[i][1],a1[i][0]),utils.poisson_distribution_new
        (a1[i][0],a1[i][1]))

#---- 1.b ----
print('1.b:')
# RNG
rng = utils.rng(seed)
# Scatter plot
N = 1000
rand = rng.rand_num(N)
plt.scatter(rand[:(len(rand)-1)],rand[1:])
plt.title('Sequential number plot for {} random numbers with seed {}'.format(1000,seed))
plt.savefig('plots/1_b_1.png')

# Histogram
N = 1000000
rand = rng.rand_num(N)
plt.hist(rand,bins=20,range=(0,1))
plt.title('Histogram of 1,000,000 randomly generated numbers'.format(1000,seed))
plt.xlabel('Number of numbers in bin')
plt.ylabel('Number values')
plt.savefig('plots/1_b_2.png')
print('Saving Histogram and scatter plot.')
```

NR_a1_1_main.py

The result of the given script is given by:

```
Original seed: 42
1.a:
Simple poisson distribution:
P(0) with mean 1: 0.36787944117144233
P(10) with mean 5: 1.887133131720812e-05
P(20) with mean 3: 4.618166957543755e-18
P(40) with mean 2.6: 6.717133577841103e-49
Large-number poisson distribution (only works for large numbers):
P(200) with mean 101: 1.2695314379023172e-18
1.b:
Saving Histogram and scatter plot.
```

NR_a1_1_main.txt

2   Exercise 2

For this section of the assignment we were asked to write a variety of different functions in order to probe the given probability function $n(x)$. These will be discussed per sub-question:
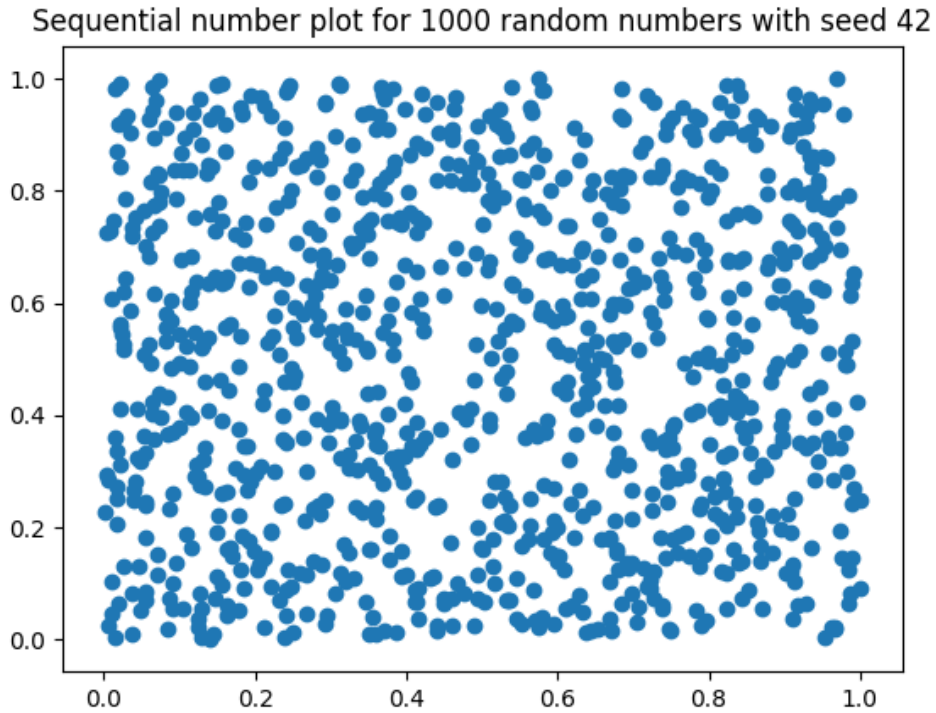
Figure 1: In this figure we can see that it appears that the random number generator is producing numbers without a certain preference.

2.1 Write a numerical integrator

In order to accomplish this task I wrote an integrator that uses Romberg's algorithm in order to numerically integrate a given function from a to b.

The output values are found in the print statement produced by the script.

2.2 Make a log-log plot and interpolate the given values

For this I used a linear-interpolator due to the fact that at first glance these values follow a linear trend in log-log space. Due to having too little time I did not manage to alter my interpolator to also work in log-space. For this reason the interpolated function systematically overshoots the fit one would expect. We can see this well in 3.

2.3 Numerically calculate $dn(x)/dx$ at $x = b$

For this task I wrote an algorithm that numerically differentiates using Ridder's method. The analytic and calculated numerical value can be found in the print statement.

2.4 Generate 3D satellite positions

In order to generate this distribution I used the rejection sampling method. The positions generated using this method can be found in the print statement.

2.5 Repeart (d) for 1000 haloes each containing 100 satellites

The histogram generated for this task can be found in 4. It appears that the generated galaxies match the distribution fairly well. It is only really lacking at the lower end of the distribution.
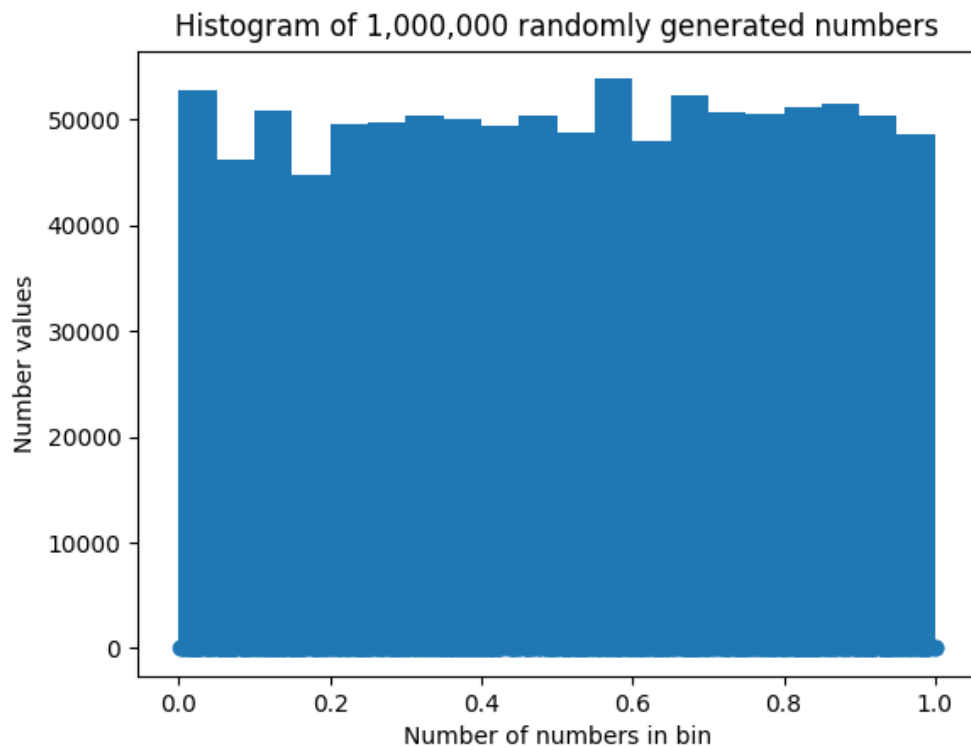
4

Figure 2: This histogram places the random number generator under a sharper knife, allowing us to see that there are some fluctuations between the bins. Overal it appears to be quite unbiased.

2.6 Write a root-finding algorithm

The method I used in order to find these roots is the Newton-Raphson method. This is because the false-position method and Secant method appeared not to be able to converge for this function. The values of the roots are given in the print output.

2.7 Take the bin from e containing the largest number of galaxies. Using sorting calculate the median, 16th and 84th percentile for this bin and output the values and plot the histogram

The calculated values for the median, 16th and 84th percentile can be found in the print statement.

The histogram produced for this task can be found in 5.

As you can (barely) see, the Poisson distribution does not match the histogram. This however is most likely due to a mistake in my Poisson distribution function.

2.8 Write an interpolator that gives values of a for different a,b,c

In order to accomplish this task I wrote a function for a trilinear-interpolator. The values I tested it with and the resulting A value can be found in the print statement.

2.9 Scripts

The functions that I wrote for this exercise can be found in:

```
1  #NR_a1_2_utils.py
2  import numpy as np
3  import sys
```
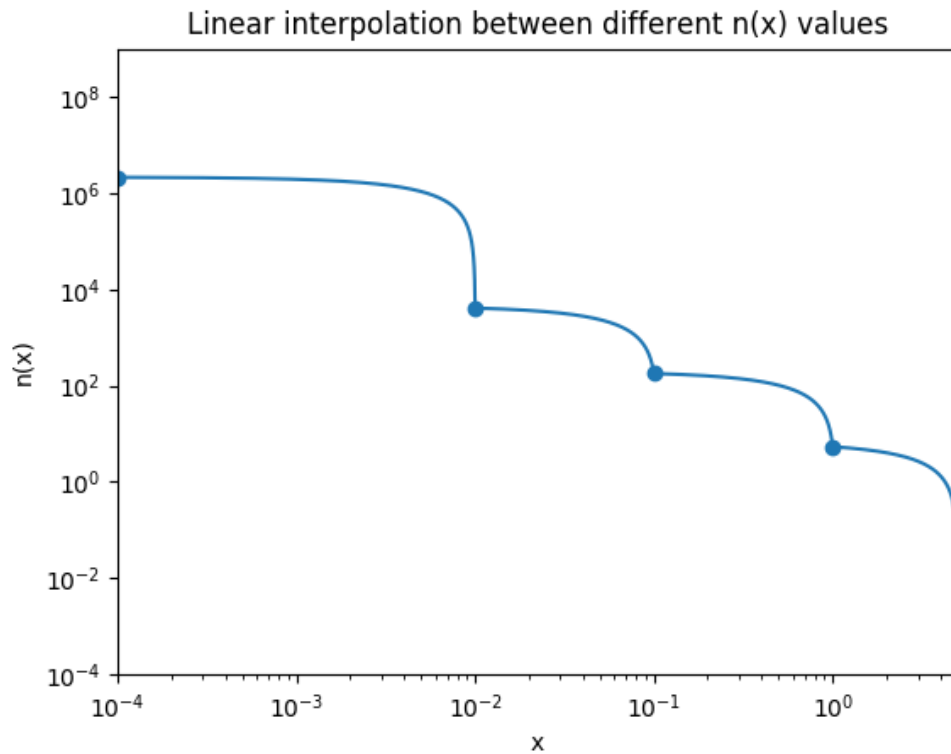
Figure 3: Here we see the way in which a linear interpolator overshoots the expected function when used in log-space.

```python
import math # Only used for math.isnan() in NewRaph_rootfinder()
from NR_a1_1_utils import poisson_distribution, rng, min, max, arg_max, arg_min

def central_diff(f,h,x):
# Calculates the central difference\n",
    return (f(x+h)-f(x-h))/(2*h)
#end central_diff()

def ridders_diff(f,x):
# Differentiates using Ridder's method
    m = 10
    D = np.zeros((m,len(x)))
    d = 2
    h = 0.001
    for i in range(m):
        D_new = D
        for j in range(i+1):
            if j == 0:
                D_new[j] = central_diff(f,h,x)
            else:
                D_new[j] = (d**(2*(j+1))*D[j-1]-D_new[j-1])/(d**(2*(j+1))-1)
        D = D_new
        h = h/d
    return D[m-1]
#end ridders_diff()

def comp_trapezoid(f,a,b,n):
# Composite trapezoid rule used in romber_int()
    h = 1/(2**(n-1))*(b-a)
    sum = 0
    for i in range(1,2**(n-1)):
        sum += f(a+i*h)
```
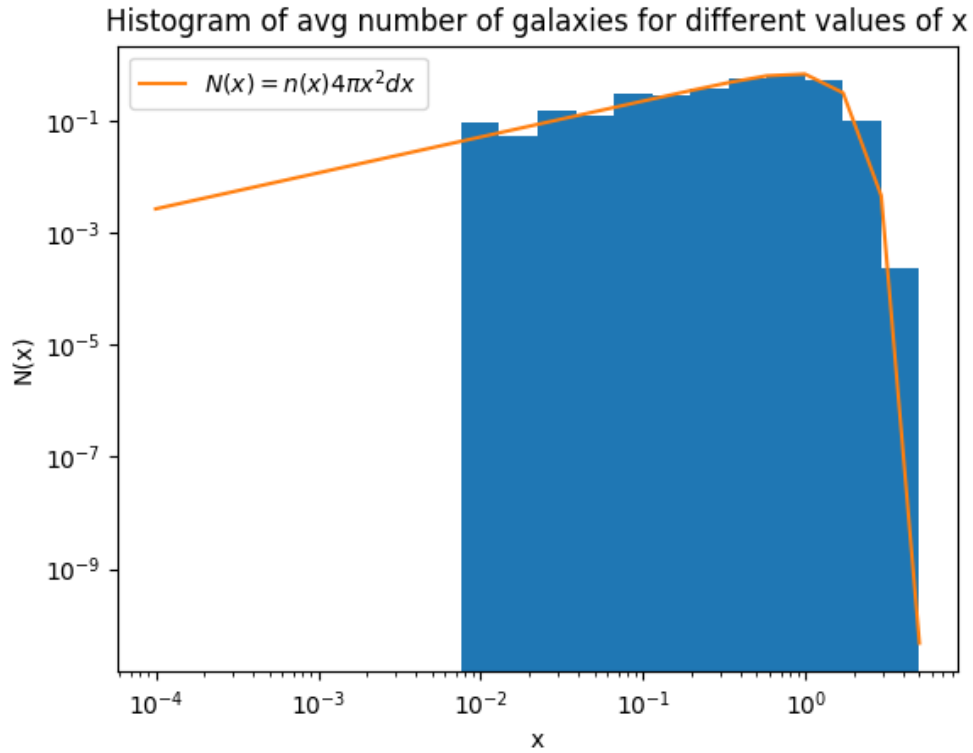
Figure 4: Histogram of number of satellites in each bin with over-plotted probability. Note the discrepancy at the lower end of the distribution.

```
36        return (h/2.)*(f(a)+2*sum+f(b))
37 #end comp_trapezoid()
38
39 def romber_int(f,a,b):
40 # Integrates from a to b up to an accuracy of 6 decimals
41      for n in range(1,10):
42          S_new = np.zeros((n))
43          S_new[0] = comp_trapezoid(f,a,b,n)
44          for j in range(2,n+1):
45              S_new[j-1] = (4**(j-1)*S_new[j-2]-S[j-2])/(4**(j-1)- 1)
46          S = S_new
47          if n > 3:
48              if abs(S[-2]-S[-1]) < 1e-6:
49                  return S[-1]
50      return S[-1]
51 #end romber_int()
52
53 def interpol_lin_log(xj,yj,x,y):
54 # Linear interpolator
55      j=0
56      xj,yj,x = np.log10(xj),np.log10(yj),np.log10(x)
57      for i in range(len(x)):
58          if x[i]>xj[j]:
59              j+=1
60          if j>4:
61              return 10**y
62          y[i]=(((yj[j]-yj[j-1])/(xj[j]-xj[j-1]))*(x[i]-xj[j]))+yj[j]
63 #end interpol_lin()
64
65 def interpol_lin(xj,yj,x,y):
66 # Linear interpolator
67      j=0
```
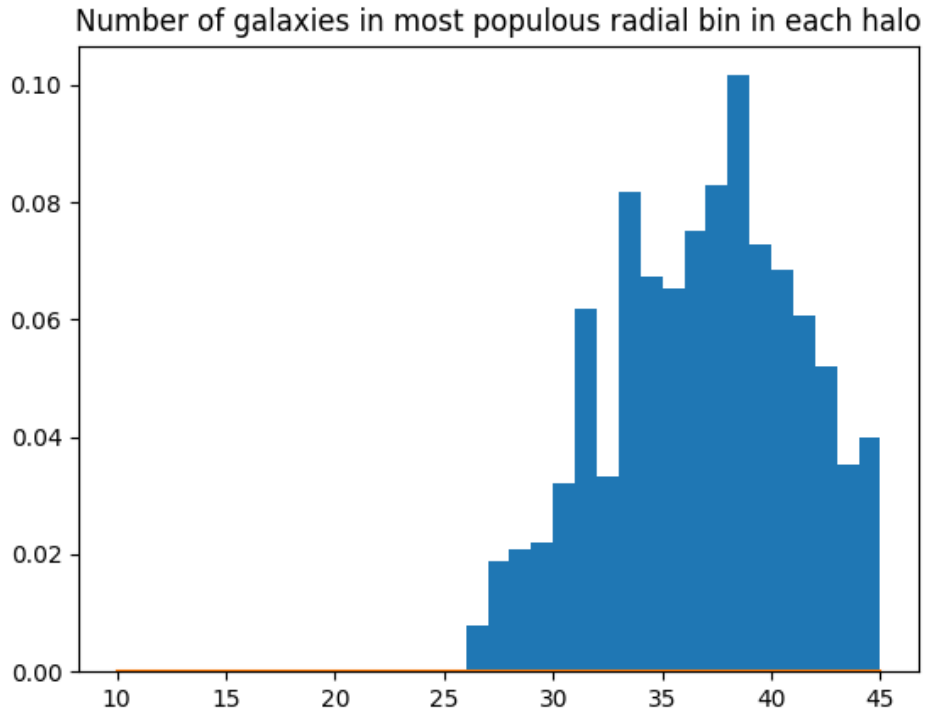
Figure 5: Number of galaxies in most populous radial bin in each halo. Note that the Poisson distribution is most likely calculated wrongly.

```
68         for i in range(len(x)):
69             if x[i]>xj[j]:
70                 j+=1
71             if j>4:
72                 return y
73             y[i]=(((yj[j]-yj[j-1])/(xj[j]-xj[j-1]))*(x[i]-xj[j]))+yj[j]
74 #end interpol_lin()
75
76 def nevils_alg(x,xj,yj,i,j):
77 # Neville's Algorithm used in interpol_neville
78     if i == j:
79         return yj[i]
80     else:
81         return ((x-xj[j])*nevils_alg(x,xj,yj,i,j-1)-(x-xj[i])*nevils_alg(x,xj,yj,i+1,j))
      /(xj[i]-xj[j])
82 #end nevils_alg()
83
84 def interpol_neville(xj,yj,x,y):
85 # Interpolator that uses Neville's Algorithm
86     for z in range(len(x)):
87         y[z] = nevils_alg(x[z],xj,yj,0,len(xj)-1)
88     return y
89 #end interpol_neville()
90
91 def rejection_sampler(n,p,max_x,max_y,rng):
92 # Rejection sampler that uses max_y value as g
93     sample_x = []
94     sample_y = []
95     n_accpt = 0
96     while n_accpt < n:
97         pot_x = np.float(rng.rand_num(1,max=max_x))
98         pot_y = np.float(rng.rand_num(1,max=max_y))
```

```python
 99            if pot_y <= p(pot_x):
100                sample_x.append(pot_x)
101                sample_y.append(pot_y)
102                n_accpt += 1
103        return sample_x, sample_y
104 #end rejection_sampler
105
106 def secant_rootfinder(f,a,b):
107 # Secant method root-finder
108        it = 0
109        while np.abs(b-a) > 0.00001:
110            it += 1
111            c = -(b-a)/float((f(b)-f(a)))*f(a)+a
112            a = b
113            b = c
114        return a
115 #end secant
116
117 def falspos_rootfinder(f,a,b):
118 # False position method root-finder
119        it = 0
120        c = 0
121        while np.abs(b-a) > 0.001:
122            it += 1
123            c = -(b-a)/float((f(b)-f(a)))*f(a)+a
124            print('a',a,', b',b)
125            print('c',c)
126            if f(a)*f(c) > 0:
127                a = c
128            else:
129                b = c
130        return c,it
131 #end falspos_rootfiner()
132
133 def NewRaph_rootfinder(f,a,b,rng):
134 # Finds root in given range (a,b) for f
135        x = rng.rand_num(1,min=a,max=b)
136        x_new = sys.maxsize
137        for i in range(1000):
138            f_deriv = ridders_diff(f,np.array([x]))
139            if f_deriv == 0 or math.isnan(f_deriv):
140                x = rng.rand_num(1,min=a,max=b)
141                i = 0
142                continue
143            x_new = x - f(x)/f_deriv
144            if abs(x_new-x) < 1e-12:
145                return x_new
146            else:
147                x = x_new
148        return x
149 #end NewRaph_rootfinder()
150
151 def selection_sort(l):
152 # Ascending sorting of l using selection sort
153        sl = []
154        for i in range(len(l)):
155            min = arg_min(l)
156            sl.append(l[min])
157            l = l[:min]+l[(min+1):]
158        return sl
159 #end selection_sort()
160
161 def A_calc(a,b,c):
162 # Calculates A with given values of a,b,c
163        f = lambda x: 4*np.pi* (x**(a-1))/(b**(a-3)) *np.exp(-(x/b)**c)
164        f_int = romber_int(f,0,5)
165        return 1/f_int
166 #end A_calc()
167
168 def trilinear_interpolator(al,bl,cl,Al,x,y,z):
```

```
169  # Returns an interpolated value for Al based on a,b,c values
170      def bracket_finder(xl,x):
171          for i in range(len(xl)):
172              if xl[i] > x:
173                  return xl[i-1],xl[i],i
174          print('Could not find a backet, returning nan.')
175          return float('nan'),float('nan')
176
177      a0,a1,ai = bracket_finder(al,x)
178      b0,b1,bi = bracket_finder(bl,y)
179      c0,c1,ci = bracket_finder(cl,z)
180
181      xd = (x-a0)/(a1-a0)
182      yd = (y-b0)/(b1-b0)
183      zd = (y-c0)/(c1-c0)
184
185      c00 = Al[ai-1][bi-1][ci-1]*(1-xd)+Al[ai][bi-1][ci-1]*xd
186      c01 = Al[ai-1][bi-1][ci]*(1-xd)+Al[ai][bi-1][ci]*xd
187      c10 = Al[ai-1][bi][ci-1]*(1-xd)+Al[ai][bi][ci-1]*xd
188      c11 = Al[ai-1][bi][ci]*(1-xd)+Al[ai][bi][ci]*xd
189
190      c0 = c00*(1-yd)+c10*yd
191      c1 = c01*(1-yd)+c11*yd
192
193      return c0*(1-zd)+c1*zd
194  #end trilinear_interpolator()
```

NR_a1_2_utils.py

The commands used to retrieve the desired results are given by:

```
1  #NR_a1_2_main.py
2  import numpy as np
3  import matplotlib.pyplot as plt
4  import NR_a1_2_utils as utils
5
6  seed = 42
7  print('Original seed:',seed)
8  rng = utils.rng(seed)
9
10 #--- 2.a ---
11 print('2.a:')
12 a = rng.rand_num(1,min=1.1,max=2.5)
13 b = rng.rand_num(1,min=0.5,max=2)
14 c = rng.rand_num(1,min=1.5,max=4)
15 f = lambda x: 4*np.pi* (x**(a-1))/(b**(a-3)) *np.exp(-(x/b)**c)
16 f_int = utils.romber_int(f,0,5)
17 A = 1/f_int
18 print('A = {}; a,b,c = {},{},{}'.format(A,float(a),float(b),float(c)))
19
20 #--- 2.b ---
21 print('2.b:')
22 xj = [10**-4,10**-2,10**-1,1,5]
23 n_x = lambda x: A*100*(x/b)**(a-3)*np.exp(-(x/b)**c)
24 n = n_x(xj)
25 x = np.logspace(np.log10(1e-4),np.log10(5),10000)
26 y = np.zeros(10000)
27 y_lin = utils.interpol_lin(xj,n,x,y)
28 plt.scatter(xj,n)
29 plt.plot(x,y_lin)
30 plt.xlim(left=10**-4,right=5)
31 plt.ylim(bottom=1e-4,top = 1e9)
32 plt.xscale('log')
33 plt.yscale('log')
34 plt.xlabel('x')
35 plt.ylabel('n(x)')
36 plt.title('Linear interpolation between different n(x) values')
37 plt.savefig('plots/2_b.png')
38 plt.close()
39 print('Saved interpolation plot to \'plots/2_b.png\'.')
40
```

```
41 #——— 2.c ———
42 print('2.c:')
43 n = lambda x: A*100*(x/b)**(a-3)*np.exp(-(x/b)**c)
44 x = b
45 dndx = utils.ridders_diff(n,np.array([b]))
46 dndx_analitic = lambda x: (A*100) * (((a-3)*(x/b)**(a-4)*np.exp(-(x/b)**c))/b - ((c*np.
       exp(-(x/b)**c)*(x/b)**(a+c-4))/b))
47 dndx_an = dndx_analitic(x)
48 print('dn/dx at x = b: analytic = {0:.12f}; numerical = {1:.12f}'.format(float(dndx_an),
       float(dndx)))
49
50 #——— 2.d ———
51 print('2.d:')
52 N = 100
53 xmax = 5
54 # Drawing random samples from n(x)
55 pn = lambda x: (n(x)*4*np.pi*x**2)/100
56 x_p = np.linspace(0,xmax,200)
57 g = np.max(pn(x_p)[1:])+0.01
58 samples = utils.rejection_sampler(N,pn,5,g,rng)
59 r = samples[0]
60 # Generating random angles:
61 phi = rng.rand_num(N,min=0,max=2*np.pi)
62 theta = np.arccos(2*rng.rand_num(N)-1)
63 x,y,z = r*np.sin(theta)*np.cos(phi),r*np.sin(theta)*np.sin(phi),r*np.cos(theta)
64 # Plotting positions for N galaxies
65 #ax = plt.figure().add_subplot(111,projection='3d')
66 #ax.scatter(x,y,z)
67 #plt.show()
68 print()
69 print('r,phi,theta:')
70 for i in range(len(r)):
71     print(r[i],phi[i],theta[i])
72
73
74 #——— 2.e ———
75 print('2.e:')
76 N = 100000
77 samples = utils.rejection_sampler(N,pn,5,g,rng)
78 r = samples[0]
79 bins = np.logspace(np.log10(1e-4),np.log10(xmax),num=21)
80 plt.hist(r,bins=bins,density=True)
81 plt.plot(bins,pn(bins),label = '$N(x) = n(x)4\pi x^2 dx$')
82 plt.yscale('log')
83 plt.xscale('log')
84 plt.ylabel('N(x)')
85 plt.xlabel('x')
86 plt.legend()
87 plt.title('Histogram of avg number of galaxies for different values of x')
88 plt.savefig('plots/2_e.png')
89 plt.close()
90 print('Saved histogram to \'plots/2_e.jpg\'.')
91
92 #——— 2.f ———
93 print('2.f:')
94 dpndx = utils.ridders_diff(pn,x)
95 dpndx_analytic = lambda x: A*4*np.pi*(np.exp(-(x/b)**c)*(((a-1)*b**(3-a)*x**(a-2))-(c*b
       **(2-a)*x**(a-1)*(x/b)**(c-1))))
96
97 dpndx_0 = float(utils.NewRaph_rootfinder(dpndx_analytic,1e-4,1,rng))
98 new_floor = float(pn(dpndx_0)/2)
99 pn_new_floor = lambda x: pn(x) - new_floor
100 root1 = float(utils.NewRaph_rootfinder(pn_new_floor,1e-4,dpndx_0,rng))
101 root2 = float(utils.NewRaph_rootfinder(pn_new_floor,dpndx_0,5,rng))
102 print('Roots:', root1,root2)
103
104 #——— 2.g ———
105 print('2.g:')
106 counts = np.zeros((len(bins)-1))
107 for i in r:
```

```python
108        for j in range(len(bins)-1):
109            if i < bins[j+1] and i > bins[j]:
110                counts[j] += 1
111    r_list = []
112    r_halo_distrib = np.zeros((1000))
113
114    for i in range(len(r)):
115        if r[i] < bins[utils.arg_max(counts)+1] and r[i] > bins[utils.arg_max(counts)]:
116            r_list.append(r[i])
117            r_halo_distrib[i//100] += 1
118    mean = sum(r_halo_distrib)/len(r_halo_distrib)
119    halo_bins = np.linspace(10,45,36)
120    poissd = []
121
122    for i in range(len(halo_bins)):
123        poissd.append(utils.poisson_distribution(round(mean),int(halo_bins[i])))
124
125    plt.hist(r_halo_distrib,halo_bins,density=True)
126    plt.plot(halo_bins,poissd)
127    plt.title('Number of galaxies in most populous radial bin in each halo')
128    plt.savefig('plots/2_g.png')
129    print('Saved histogram to \'plots/2_g.jpg\'.')
130    print('For some reason the poisson distribution does not work correctly here and I don\'
           t know why. It does appear that the histogram follows a fairly normal distribution,
           which is a good sign.')
131    plt.close()
132
133    sr = utils.selection_sort(r_list)
134
135    median = sr[int(len(sr)/2-0.5)]
136    p16th = sr[round(len(sr)*0.16)-1]
137    p84th = sr[round(len(sr)*0.84)-1]
138    print('Length: {}, median: {}, 16th: {}, 84th: {}'.format(len(sr),median,p16th,p84th))
139
140    #—— 2.h ——
141    print('2.h:')
142    al = np.linspace(1.1,2.5,15)
143    bl = np.linspace(0.5,2,16)
144    cl = np.linspace(1.5,4,26)
145    param = np.array((al,bl,cl))
146    Al = np.zeros([len(al),len(bl),len(cl)])
147    for i in range(len(al)):
148        for j in range(len(bl)):
149            for k in range(len(cl)):
150                Al[i][j][k] = utils.A_calc(al[i],bl[j],cl[k])
151
152    interpol = utils.trilinear_interpolator(al,bl,cl,Al,2.05,1.05,3.05)
153    print('Interpolator was tested with following values:')
154    print('For a = {}, b = {}, c = {}, the interpolator returned A = {}.'.format
           (2.05,1.05,3.05,interpol))
```

<div align="center">NR_a1_2_main.py</div>

The result of the given script is given by:

```
1   Original seed: 42
2   2.a:
3   A = 0.04701878985790245; a,b,c =
        1.6419613428029698,1.4577252811360346,2.6047059307084877
4   2.b:
5   Saved interpolation plot to 'plots/2_b.png'.
6   2.c:
7   dn/dx at x = b: analytic = −4.702159549813; numerical = −4.702159549822
8   2.d:
9
10  r,phi,theta:
11  0.7311141707122876 1.6028076635948272 0.2270265285598231
12  2.197278770187982 5.29883706734633 1.3425005017754366
13  1.261066210848445 0.4705410840621936 1.652797361141153
14  0.6558716361204144 5.012800547859235 2.280159240554945
15  0.7824897836202369 3.2051614706482767 1.109519113847493
```

```
16  0.5641889930754497 4.239148403641524 2.5313275914354216
17  0.7455003237080227 1.3378904226799089 2.07121896558909
18  0.9233498635882491 0.13554910534546938 0.8080191138718723
19  0.6646036870484072 2.593921050894136 0.6430905972730414
20  1.422587656024743 1.5936802052506487 1.1961750855480042
21  1.2151205803427914 3.3866416280089577 1.371971552370749
22  0.2683698883997805 3.983288228149664 2.34892948705019
23  0.5195498142643846 0.3023185592993231 0.20783067746454917
24  0.4319417574879957 2.0002705470795115 2.114834963001796
25  0.45944451540419623 3.701972044276426 2.720290327493936
26  0.8006572399002244 4.274590237546436 1.7464117024831116
27  0.2804255826180151 2.086678285518562 1.2565200536872243
28  1.7281651532360687 1.493229941026918 1.5682490721280593
29  0.4403162291018148 5.51406175002302 2.3134558412397968
30  0.28005365086933415 4.1667562336864306 1.2754577518288508
31  0.629885215859386 3.126371193501809 0.8823133533723011
32  1.3341331154888179 3.744806626025325 2.431634242424714
33  1.8027138385254526 3.577180243900044 1.47799705232885
34  0.2378761548099098 0.21519768812236728 2.7532126716994534
35  0.7747006558042651 3.686789510644586 1.1150685587388856
36  0.6869077696133774 3.636542606711427 1.8470806713450534
37  1.4117884436667754 3.7242596526259963 0.891581350772273
38  0.6294095410752514 1.2088053560981842 0.8448593580067348
39  1.2764752027254045 1.098289778440001 1.4188595428183999
40  1.6150927683803165 1.9199926678160373 2.8470316361511516
41  0.418668999225968 5.637045372231429 1.9593635789694905
42  0.5461799853935555 2.2252698686054537 0.17807153021610092
43  0.6829810271722446 0.24992055211606554 1.2590866128292584
44  0.6234502914389102 1.5575463076869536 1.195224966142777
45  1.3366949341522365 3.0485171580618378 0.5212172093727148
46  0.6499529248316984 2.5940784042398093 1.453743194278108
47  0.9067285203917376 2.132532890780963 0.7257116272553009
48  1.5146136209601937 2.404549315401679 1.978017257685901
49  0.2770245026144908 6.164596891659123 1.4694682169604514
50  0.5159651931040894 2.3253515653634365 1.1861233069219161
51  0.4759216002517306 6.047620429111068 0.5387480016708217
52  2.247016406983809 0.13409749171900837 1.3807219348619766
53  1.5602946396462583 6.218389640083777 2.186858237035807
54  2.3029029642531844 3.3462652294283277 0.44126303356763348
55  0.6965374980804753 0.4498323703870266 0.43329541725053206
56  1.1409926578391123 0.7249796633728953 0.9982803668408025
57  0.6653952740755197 1.0253133385140492 1.9986788291368351
58  1.6205144185041889 1.005557374832275 0.4313321487854299
59  1.0420429483652858 3.4936712489898514 1.1563665983921778
60  1.8162715311433768 4.398841225589391 1.257522673876321
61  1.753618683902485 3.9458599495477777 2.8651583133590033
62  0.9075665701160043 5.367493156386626 2.631654291756891
63  2.196964042542822 2.597252707137583 1.724099860613247
64  1.335804466710699 0.4204979764301613 0.7175964769213862
65  0.1827132537627097 2.241282270808069 0.853186798298481
66  0.7038700495210275 2.3096897199004744 1.9112929888501538
67  1.7123198598059761 6.120340636505855 1.8682558561336253
68  2.079763440168249 2.150644043039724 2.314405830493339
69  1.8501341524498836 4.948950050730439 2.7251108593102016
70  0.8911001722393586 0.8143685684732586 2.022113824428344
71  1.091892711619008 5.552002315953939 1.7871299593017478
72  2.0542049463220273 3.7792343179439785 2.455513735502
73  1.3211167003377824 2.8219224435250907 0.8302843336903301
74  1.5889036994914583 3.862410859025583 0.20885659658253541
75  0.9993672674922676 4.64144387553411 1.2991381763462724
76  0.21591307901877496 5.32616256645649 2.161269458308147
77  1.6492796030749581 3.2963015420602892 2.239559557821826
78  1.4581203252216812 2.927113955421931 1.8842855313416325
79  2.4482548492097473 4.3877153728887714 1.532180548712544
80  1.9948482716434734 0.8685057783736273 0.5763854455089538
81  0.9218681038047252 3.987296975053835 0.5972229423329523
82  0.44154526532833743 3.2402812512358494 1.1749082354327303
83  0.18173811352986738 1.7758883998026385 1.3174654425683672
84  0.5187689966449206 4.543296053760293 1.7492149796888092
85  1.3650977926903596 0.6726655795284455 2.6194128692669856
```

```
86  1.4861118717435184  5.627875870996373  0.6574243816564097
87  1.5804517116615513  1.2429693794730885  1.8099719124226885
88  0.7420420489988011  5.30214916092477  0.8281478177090664
89  1.3314795740982264  2.3793285612306017  2.3801303781445413
90  0.6407129680532632  0.8940786201724139  1.7575270804295209
91  0.732255000028955  5.290332743081566  1.6484916266608831
92  0.3504764783590363  6.08738404395324  2.8246659302385067
93  1.4659929210709874  6.282353866008897  2.402429041978465
94  1.9332396764300799  0.5667864302431423  1.5154492416588403
95  1.8020963918757016  0.6313214477879985  0.9514025960075138
96  1.1281752377936851  3.4268531372170266  2.1126890895625485
97  0.8940159908580776  4.507780842667583  1.2803535540003392
98  0.5783915184826695  6.095133351100733  1.2642369297377836
99  0.8172476257165974  4.896468153276877  1.5065904525286185
100 1.5578782882469553  2.94710820289594  0.653235189348019
101 0.7787656442861324  5.320419139190734  1.771281526346205
102 0.4080652971728931  4.270079657246644  1.8380359213790045
103 0.07337931053185985  2.6303052090296744  2.031693926313672
104 0.9549057503078782  2.189789006551835  2.1302858225822474
105 1.0740411498593938  4.667855605228215  2.1200254410634685
106 1.181490451901903  0.912168796509376  3.002947455960485
107 1.970841873281359  0.05396950164989878  2.0157468651014
108 1.415274167720679  4.574893947574355  1.2887032759180237
109 0.8888173153903209  0.7663566943066645  1.6355426458896933
110 1.4996123211828571  1.957684533443223  2.49707290293986
111 2.e:
112 Saved histogram to 'plots/2_e.jpg'.
113 2.f:
114 Roots: 0.1987318674472368  1.6407030708001724
115 2.g:
116 Saved histogram to 'plots/2_g.jpg'.
117 For some reason the poisson distribution does not work correctly here and I don't know
        why. It does appear that the histogram follows a fairly normal distribution, which
        is a good sign.
118 Length: 37615, median: 1.2773704178216243, 16th: 1.0771942122640141, 84th:
        1.5217983937551454
119 2.h:
120 Interpolator was tested with following values:
121 For a = 2.05, b = 1.05, c = 3.05, the interpolator returned A = 0.14501036855034055.
```

NR_a1_2_main.txt

3 Exercise 3

For the third exercise we were to work with the data given to us. We also had to write down the log-likelihood corresponding to a set of random realizations of the satellite profile. This is give by:

$$\log L = N \log(A(a,b,c) + (a-1)(\sum_{i=1}^{N-1} \log(x_i) - N \log(b)) + \sum_{i=1}^{N-1} -(\frac{x_i}{b})^c \tag{1}$$

3.1 Find the a,b,c that maximize this likelihood

In order to accomplish this task I decided to find the minimum of the $-log$ likelihood. For this I wrote an algorithm that uses the Simplex (also known as the Nelder-Mead method). This function worked well for the test function that I gave it, but I did not manage to keep it within the range given for a,b,c. Given a bit more time, this function would most likely have worked. In order to test it I used the data found in $satgals_m15$.

3.2 Write an interpolator for a,b and c as a function of halo mass, or fit a function to each.

I did not manage to accomplish this task due to time constraints.

3.3 Scripts

The functions that I wrote for this exercise can be found in:

```python
#NR_a1_3_utils.py
import numpy as np
import sys
from NR_a1_1_utils import poisson_distribution, rng, min, max, arg_max,arg_min
from NR_a1_2_utils import romber_int

def selection_sort4simplex(xs,fxs):
# Ascending sorting of xs and fxs based on fxs values using selection sort
    sfxs = []
    sxs = []
    index = []
    #print(fxs)
    for i in range(len(fxs)):
        min = arg_min(fxs)
        sfxs.append(fxs[min])
        sxs.append(xs[min])
        #print(sxs,sfxs)
        if sfxs[i] == fxs[0]:
            fxs = fxs[(min+1):]
            xs = xs[(min+1):]
        elif sfxs[i] == fxs[-1]:
            fxs = fxs[:min]
            xs = xs[:min]
        else:
            #print('min',min)
            #print('xs',xs[:min],xs[(min+1):])
            fxs = np.append(fxs[:min],fxs[(min+1):])
            xs = np.concatenate((xs[:min],xs[(min+1):]))
        #print(xs,fxs)
    return np.array(sxs),np.array(sfxs)
#end selection_sort4simplex()

def downhill_simplex(f,a,b,c,la = [-2**32,2**32],lb = [-2**32,2**32],lc =
    [-2**32,2**32]):
#Optimizing function
    alpha,beta,gamma = 1,1,0.3
    rngen = rng(14)

    # Generate starting points
    xs = [[a,b,c]]
    for i in range(3):
        xs.append([np.round(float(a+rngen.rand_num(1)),2),np.round(float(b+rngen.
    rand_num(1)),2),np.round(float(c+rngen.rand_num(1)),2)])
        xs.append([float(a+rngen.rand_num(1)),float(b+rngen.rand_num(1)),float(c+rngen.
    rand_num(1))])
    xs = np.array(xs)

    #Centroid function
    centroid = lambda xs: np.array([sum(xs[:,0]),sum(xs[:,1]),sum(xs[:,2])])/len(xs)
    it = 0
    N = 1000
    while it < N:
        it += 1
        # Reorder the points from best to worst
        fxs = f(xs)
        xs,fxs = selection_sort4simplex(xs,fxs)
        print('————————————————')
        print('xs:',xs)
        print('fxs:',fxs)
        #Generate a trial point by reflection
        c = centroid(xs)
        print('Centroid:',c)
        x_new = np.array([c + alpha*(c-xs[-1])])
        print('x_new:',x_new)
        if x_new[0][0] < la[0] or x_new[0][0] > la[1] or x_new[0][1] < lb[0] or x_new
    [0][1] > lb[1] or x_new[0][2] < lc[0] or x_new[0][2] > lc[1]:
```

```
63              fx_new = 2**32
64          else:
65              fx_new = f(x_new)
66          print('fx_new',fx_new)
67
68          if fx_new < fxs[0]: #Expansion
69              print('Expanding')
70              x_exp = x_new + beta*(x_new-c)
71              if f(x_exp) < f(x_new):
72                  xs[-1] = x_exp
73              else:
74                  xs[-1] = x_new
75
76          elif fx_new > fxs[-1]: #Contraction
77              fx_cont = sys.maxsize
78              wit = 0
79              while fx_cont > fxs[-1] and wit < 10:
80                  wit += 1
81                  print('Contracting')
82                  x_cont = np.array([c +gamma*(xs[-1]-c)])
83                  if x_cont[0][0] < la[0] or x_cont[0][0] > la[1] or x_cont[0][1] < lb[0]
        or x_cont[0][1] > lb[1] or x_cont[0][2] < lc[0] or x_cont[0][2] > lc[1]:
84                      fx_cont = 2**32
85                      gamma = gamma*0.9
86                  else:
87                      fx_cont = f(x_cont)
88              xs[-1] = x_cont
89
90          else: #Back to reflection
91              print('Back to top')
92              xs[-1] = x_new
93
94          if np.abs(fxs[0]-fxs[1]) < 1e-15:
95              print('Found minimum after {} iterations'.format(it))
96              return xs[0],fxs[0]
97      print('Reached maximum number of iterations, returning best coordinates...')
98      return xs[0],fxs[0]
99  #end downhill_simplex()
100
101 def minlog_likelyhood(abc):
102 # Returns the log_likelyhood of n(x) for given parameters
103     a,b,c = abc[:,0],abc[:,1],abc[:,2]
104
105     #Calculating A
106     A = []
107     for i in range(len(abc)):
108         f = lambda x: 4*np.pi* (x**(a[i]-1))/(b[i]**(a[i]-3)) *np.exp(-(x/b[i])**c[i])
109         A.append(1/romber_int(f,0,5))
110     print(A)
111
112     #Calculating rest of the formula
113     N = len(data)
114     logSum,expSum = 0,0
115     for i in data:
116         logSum += np.log(i)
117         expSum += -1*(i/b)**c
118     return -(N*np.log(A) + (a-1)*(logSum-N*np.log(b)) + expSum)
119 #end log_likelyhood()
```

NR_a1_3_utils.py

The commands used to retrieve the desired results are given by:

```
1  #NR_a1_3_main.py
2  import numpy as np
3  import matplotlib.pyplot as plt
4  import NR_a1_3_utils as utils
5
6  #--- 3.a ---
7  print('3.a:')
8  a,b,c = 10.,3.,3.
```

```
 9  xs = [[a,b,c]]
10  f = lambda xs : (xs[:,0]-1/3)**2+(xs[:,1]-2/3)**2+(xs[:,2]-1/3)**2
11  min = utils.downhill_simplex(f,a,b,c)
12  #print(min)
13  #print('Found the minimum value {4} at a,b,c = {0},{1},{2}')(min[0][0],min[0][1],min
        [0][2],min[1])
14
15  x = utils.data_unpacker('satgals_m15.txt')
16  la,lb,lc = [1.1,2.5],[0.5,2.],[1.5,4.] #Giving a,b,c value range
17  min = utils.downhill_simplex(utils.minlog_likelyhood,1.8,1.25,2.75,la,lb,lc)
18  #print('Found the minimum value {4} at a,b,c = {0},{1},{2}')(min[0][0],min[0][1],min
        [0][2],min[1])
19  print('This almost works correctly, only thing that needs to be done is to properly
        enforce range of abc, values.')
```

NR_a1_3_main.py

The result of the given script is given by:

```
 1  3.a:
 2  _____
 3  xs: [[10.          3.           3.          ]
 4   [10.1          3.09          3.72        ]
 5   [10.33         3.06          3.4         ]
 6   [10.5083468    3.2285738     3.43539571]
 7   [10.30568028   3.53014945    3.81299733]
 8   [10.65         3.2           3.18        ]
 9   [10.8805182    3.29741216    3.99524975]]
10  fxs: [106.          112.72983333 115.06583333 119.71705813 119.7552989
11   120.9549      131.57356242]
12  Centroid: [10.39636361   3.20087649   3.50623469]
13  x_new: [[9.91220902 3.10434081 3.01721962]]
14  fx_new [104.90036025]
15  Expanding
16  _____
17  xs: [[ 9.42805443   3.00780514   2.52820455]
18   [10.          3.           3.          ]
19   [10.1          3.09          3.72        ]
20   [10.33         3.06          3.4         ]
21   [10.5083468    3.2285738     3.43539571]
22   [10.30568028   3.53014945    3.81299733]
23   [10.65         3.2           3.18        ]]
24  fxs: [ 93.01234079 106.          112.72983333 115.06583333 119.71705813
25   119.7552989  120.9549     ]
26  Centroid: [10.18886879   3.15950406   3.2966568 ]
27  x_new: [[9.72773757 3.11900811 3.4133136 ]]
28  fx_new [103.75508802]
29  Back to top
30  _____
31  xs: [[ 9.42805443   3.00780514   2.52820455]
32   [ 9.72773757   3.11900811   3.4133136 ]
33   [10.          3.           3.          ]
34   [10.1          3.09          3.72        ]
35   [10.33         3.06          3.4         ]
36   [10.5083468    3.2285738     3.43539571]
37   [10.30568028   3.53014945    3.81299733]]
38  fxs: [ 93.01234079 103.75508802 106.          112.72983333 115.06583333
39   119.71705813 119.7552989 ]
40  Centroid: [10.05711701   3.14793379   3.32998731]
41  x_new: [[9.80855374 2.76571812 2.84697729]]
42  fx_new [100.50422472]
43  Back to top
44  _____
45  xs: [[ 9.42805443   3.00780514   2.52820455]
46   [ 9.80855374   2.76571812    2.84697729]
47   [ 9.72773757   3.11900811    3.4133136 ]
48   [10.          3.           3.          ]
49   [10.1          3.09          3.72        ]
50   [10.33         3.06          3.4         ]
51   [10.5083468    3.2285738     3.43539571]]
52  fxs: [ 93.01234079 100.50422472 103.75508802 106.          112.72983333
```

```
53  115.06583333 119.71705813]
54 Centroid: [9.98609893 3.03872931 3.19198445]
55 x_new: [[9.46385107 2.84888482 2.94857319]]
56 fx_new [94.96790975]
57 Back to top
58 ————————————
59 xs: [[ 9.42805443  3.00780514  2.52820455]
60  [ 9.46385107  2.84888482  2.94857319]
61  [ 9.80855374  2.76571812  2.84697729]
62  [ 9.72773757  3.11900811  3.4133136 ]
63  [10.          3.          3.         ]
64  [10.1         3.09        3.72       ]
65  [10.33        3.06        3.4        ]]
66 fxs: [ 93.01234079  94.96790975 100.50422472 103.75508802 106.
67  112.72983333 115.06583333]
68 Centroid: [9.83688526 2.98448803 3.12243838]
69 x_new: [[9.34377052 2.90897605 2.84487675]]
70 fx_new [92.52378]
71 Expanding
72 ————————————
73 xs: [[ 8.85065578  2.83346408  2.56731513]
74  [ 9.42805443  3.00780514  2.52820455]
75  [ 9.46385107  2.84888482  2.94857319]
76  [ 9.80855374  2.76571812  2.84697729]
77  [ 9.72773757  3.11900811  3.4133136 ]
78  [10.          3.          3.         ]
79  [10.1         3.09        3.72       ]]
80 fxs: [ 82.23046731  93.01234079  94.96790975 100.50422472 103.75508802
81  106.          112.72983333]
82 Centroid: [9.62555037 2.95212575 3.00348339]
83 x_new: [[9.15110074 2.8142515  2.28696679]]
84 fx_new [86.18182636]
85 Back to top
86 ————————————
87 xs: [[ 8.85065578  2.83346408  2.56731513]
88  [ 9.15110074  2.8142515   2.28696679]
89  [ 9.42805443  3.00780514  2.52820455]
90  [ 9.46385107  2.84888482  2.94857319]
91  [ 9.80855374  2.76571812  2.84697729]
92  [ 9.72773757  3.11900811  3.4133136 ]
93  [10.          3.          3.         ]]
94 fxs: [ 82.23046731  86.18182636  93.01234079  94.96790975 100.50422472
95  103.75508802 106.         ]
96 Centroid: [9.48999333 2.91273311 2.79876436]
97 x_new: [[8.97998667 2.82546622 2.59752873]]
98 fx_new [84.55161016]
99 Back to top
100 ————————————
101 xs: [[8.85065578 2.83346408 2.56731513]
102  [8.97998667 2.82546622 2.59752873]
103  [9.15110074 2.8142515  2.28696679]
104  [9.42805443 3.00780514 2.52820455]
105  [9.46385107 2.84888482 2.94857319]
106  [9.80855374 2.76571812 2.84697729]
107  [9.72773757 3.11900811 3.4133136 ]]
108 fxs: [ 82.23046731  84.55161016  86.18182636  93.01234079  94.96790975
109  100.50422472 103.75508802]
110 Centroid: [9.34427714 2.88779971 2.74126847]
111 x_new: [[8.96081671 2.65659131 2.06922333]]
112 fx_new [81.40658366]
113 Expanding
114 ————————————
115 xs: [[8.57735628 2.42538291 1.3971782 ]
116  [8.85065578 2.83346408 2.56731513]
117  [8.97998667 2.82546622 2.59752873]
118  [9.15110074 2.8142515  2.28696679]
119  [9.42805443 3.00780514 2.52820455]
120  [9.46385107 2.84888482 2.94857319]
121  [9.80855374 2.76571812 2.84697729]]
122 fxs: [ 72.18876314  82.23046731  84.55161016  86.18182636  93.01234079
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123     94.96790975 100.50422472]
124 Centroid: [9.17993696 2.7887104  2.45324912]
125 x_new: [[8.55132018 2.81170268 2.05952096]]
126 fx_new [75.11621096]
127 Back to top
128 —————————
129 xs: [[8.57735628 2.42538291 1.3971782 ]
130  [8.55132018 2.81170268 2.05952096]
131  [8.85065578 2.83346408 2.56731513]
132  [8.97998667 2.82546622 2.59752873]
133  [9.15110074 2.8142515  2.28696679]
134  [9.42805443 3.00780514 2.52820455]
135  [9.46385107 2.84888482 2.94857319]]
136 fxs: [72.18876314 75.11621096 82.23046731 84.55161016 86.18182636 93.01234079
137  94.96790975]
138 Centroid: [9.00033216 2.79527962 2.34075536]
139 x_new: [[8.53681326 2.74167442 1.73293753]]
140 fx_new [73.56163196]
141 Back to top
142 —————————
143 xs: [[8.57735628 2.42538291 1.3971782 ]
144  [8.53681326 2.74167442 1.73293753]
145  [8.55132018 2.81170268 2.05952096]
146  [8.85065578 2.83346408 2.56731513]
147  [8.97998667 2.82546622 2.59752873]
148  [9.15110074 2.8142515  2.28696679]
149  [9.42805443 3.00780514 2.52820455]]
150 fxs: [72.18876314 73.56163196 75.11621096 82.23046731 84.55161016 86.18182636
151  93.01234079]
152 Centroid: [8.86789819 2.77996385 2.16709313]
153 x_new: [[8.30774195 2.55212257 1.8059817 ]]
154 fx_new [69.31482998]
155 Expanding
156 —————————
157 xs: [[7.74758571 2.32428128 1.44487028]
158  [8.57735628 2.42538291 1.3971782 ]
159  [8.53681326 2.74167442 1.73293753]
160  [8.55132018 2.81170268 2.05952096]
161  [8.85065578 2.83346408 2.56731513]
162  [8.97998667 2.82546622 2.59752873]
163  [9.15110074 2.8142515  2.28696679]]
164 fxs: [58.95433893 72.18876314 73.56163196 75.11621096 82.23046731 84.55161016
165  86.18182636]
166 Centroid: [8.62783123 2.68231759 2.01233109]
167 x_new: [[8.10456172 2.55038367 1.73769539]]
168 fx_new [65.91261316]
169 Back to top
170 —————————
171 xs: [[7.74758571 2.32428128 1.44487028]
172  [8.10456172 2.55038367 1.73769539]
173  [8.57735628 2.42538291 1.3971782 ]
174  [8.53681326 2.74167442 1.73293753]
175  [8.55132018 2.81170268 2.05952096]
176  [8.85065578 2.83346408 2.56731513]
177  [8.97998667 2.82546622 2.59752873]]
178 fxs: [58.95433893 65.91261316 72.18876314 73.56163196 75.11621096 82.23046731
179  84.55161016]
180 Centroid: [8.47832566 2.64462218 1.93386374]
181 x_new: [[7.97666465 2.46377814 1.27019876]]
182 fx_new [62.52784003]
183 Back to top
184 —————————
185 xs: [[7.74758571 2.32428128 1.44487028]
186  [7.97666465 2.46377814 1.27019876]
187  [8.10456172 2.55038367 1.73769539]
188  [8.57735628 2.42538291 1.3971782 ]
189  [8.53681326 2.74167442 1.73293753]
190  [8.55132018 2.81170268 2.05952096]
191  [8.85065578 2.83346408 2.56731513]]
192 fxs: [58.95433893 62.52784003 65.91261316 72.18876314 73.56163196 75.11621096
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193    82.23046731]
194  Centroid: [8.33499394 2.59295245 1.74424518]
195  x_new: [[7.8193321  2.35244083 0.92117523]]
196  fx_new [59.22757016]
197  Back to top
198  ————————
199  xs: [[7.74758571 2.32428128 1.44487028]
200   [7.8193321  2.35244083 0.92117523]
201   [7.97666465 2.46377814 1.27019876]
202   [8.10456172 2.55038367 1.73769539]
203   [8.57735628 2.42538291 1.3971782 ]
204   [8.53681326 2.74167442 1.73293753]
205   [8.55132018 2.81170268 2.05952096]]
206  fxs: [58.95433893 59.22757016 62.52784003 65.91261316 72.18876314 73.56163196
207   75.11621096]
208  Centroid: [8.18766198 2.52423485 1.50908234]
209  x_new: [[7.82400379 2.23676702 0.95864372]]
210  fx_new [58.96637212]
211  Back to top
212  ————————
213  xs: [[7.74758571 2.32428128 1.44487028]
214   [7.82400379 2.23676702 0.95864372]
215   [7.8193321  2.35244083 0.92117523]
216   [7.97666465 2.46377814 1.27019876]
217   [8.10456172 2.55038367 1.73769539]
218   [8.57735628 2.42538291 1.3971782 ]
219   [8.53681326 2.74167442 1.73293753]]
220  fxs: [58.95433893 58.96637212 59.22757016 62.52784003 65.91261316 72.18876314
221   73.56163196]
222  Centroid: [8.08375964 2.44210118 1.35181416]
223  x_new: [[7.63070603 2.14252794 0.97069078]]
224  fx_new [55.83603933]
225  Expanding
226  ————————
227  xs: [[7.17765242 1.8429547  0.58956741]
228   [7.74758571 2.32428128 1.44487028]
229   [7.82400379 2.23676702 0.95864372]
230   [7.8193321  2.35244083 0.92117523]
231   [7.97666465 2.46377814 1.27019876]
232   [8.10456172 2.55038367 1.73769539]
233   [8.57735628 2.42538291 1.3971782 ]]
234  fxs: [48.2940132  58.95433893 58.96637212 59.22757016 62.52784003 65.91261316
235   72.18876314]
236  Centroid: [7.88959381 2.31371265 1.18847557]
237  x_new: [[7.20183134 2.20204239 0.97977294]]
238  fx_new [49.9515276]
239  Back to top
240  ————————
241  xs: [[7.17765242 1.8429547  0.58956741]
242   [7.20183134 2.20204239 0.97977294]
243   [7.74758571 2.32428128 1.44487028]
244   [7.82400379 2.23676702 0.95864372]
245   [7.8193321  2.35244083 0.92117523]
246   [7.97666465 2.46377814 1.27019876]
247   [8.10456172 2.55038367 1.73769539]]
248  fxs: [48.2940132  49.9515276  58.95433893 58.96637212 59.22757016 62.52784003
249   65.91261316]
250  Centroid: [7.69309025 2.28180686 1.12884625]
251  x_new: [[7.28161877 2.01323005 0.51999711]]
252  fx_new [50.12674688]
253  Back to top
254  ————————
255  xs: [[7.17765242 1.8429547  0.58956741]
256   [7.20183134 2.20204239 0.97977294]
257   [7.28161877 2.01323005 0.51999711]
258   [7.74758571 2.32428128 1.44487028]
259   [7.82400379 2.23676702 0.95864372]
260   [7.8193321  2.35244083 0.92117523]
261   [7.97666465 2.46377814 1.27019876]]
262  fxs: [48.2940132  49.9515276  50.12674688 58.95433893 58.96637212 59.22757016
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263  62.52784003]
264 Centroid: [7.57552697 2.20507063 0.95488935]
265 x_new: [[7.17438929 1.94636312 0.63957994]]
266 fx_new [48.53145662]
267 Back to top
268 ————————
269 xs: [[7.17765242 1.8429547  0.58956741]
270  [7.17438929 1.94636312 0.63957994]
271  [7.20183134 2.20204239 0.97977294]
272  [7.28161877 2.01323005 0.51999711]
273  [7.74758571 2.32428128 1.44487028]
274  [7.82400379 2.23676702 0.95864372]
275  [7.8193321  2.35244083 0.92117523]]
276 fxs: [48.2940132  48.53145662 49.9515276  50.12674688 58.95433893 58.96637212
277  59.22757016]
278 Centroid: [7.4609162  2.1311542  0.86480095]
279 x_new: [[7.10250031 1.90986756 0.80842666]]
280 fx_new [47.59288369]
281 Expanding
282 ————————
283 xs: [[6.74408441 1.68858093 0.75205237]
284  [7.17765242 1.8429547  0.58956741]
285  [7.17438929 1.94636312 0.63957994]
286  [7.20183134 2.20204239 0.97977294]
287  [7.28161877 2.01323005 0.51999711]
288  [7.74758571 2.32428128 1.44487028]
289  [7.82400379 2.23676702 0.95864372]]
290 fxs: [42.31736381 48.2940132  48.53145662 49.9515276  50.12674688 58.95433893
291  58.96637212]
292 Centroid: [7.30730939 2.03631707 0.84064054]
293 x_new: [[6.79061499 1.83586712 0.72263736]]
294 fx_new [43.21507373]
295 Back to top
296 ————————
297 xs: [[6.74408441 1.68858093 0.75205237]
298  [6.79061499 1.83586712 0.72263736]
299  [7.17765242 1.8429547  0.58956741]
300  [7.17438929 1.94636312 0.63957994]
301  [7.20183134 2.20204239 0.97977294]
302  [7.28161877 2.01323005 0.51999711]
303  [7.74758571 2.32428128 1.44487028]]
304 fxs: [42.31736381 43.21507373 48.2940132  48.53145662 49.9515276  50.12674688
305  58.95433893]
306 Centroid: [7.15968242 1.97904566 0.80692534]
307 x_new: [[6.57177913 1.63381003 0.16898041]]
308 fx_new [39.8805841]
309 Expanding
310 ————————
311 xs: [[ 5.98387584  1.28857441 −0.46896453]
312  [ 6.74408441  1.68858093  0.75205237]
313  [ 6.79061499  1.83586712  0.72263736]
314  [ 7.17765242  1.8429547   0.58956741]
315  [ 7.17438929  1.94636312  0.63957994]
316  [ 7.20183134  2.20204239  0.97977294]
317  [ 7.28161877  2.01323005  0.51999711]]
318 fxs: [32.95908167 42.31736381 43.21507373 48.2940132  48.53145662 49.9515276
319  50.12674688]
320 Centroid: [6.90772387 1.83108753 0.53352037]
321 x_new: [[6.53382896 1.64894501 0.54704363]]
322 fx_new [39.45668884]
323 Back to top
324 ————————
325 xs: [[ 5.98387584  1.28857441 −0.46896453]
326  [ 6.53382896  1.64894501  0.54704363]
327  [ 6.74408441  1.68858093  0.75205237]
328  [ 6.79061499  1.83586712  0.72263736]
329  [ 7.17765242  1.8429547   0.58956741]
330  [ 7.17438929  1.94636312  0.63957994]
331  [ 7.20183134  2.20204239  0.97977294]]
332 fxs: [32.95908167 39.45668884 42.31736381 43.21507373 48.2940132  48.53145662
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333  49.9515276 ]
334 Centroid: [6.80089675 1.77904681 0.53738416]
335 x_new: [[6.39996216 1.35605123 0.09499538]]
336 fx_new [37.33604141]
337 Back to top
338 ————————
339 xs: [[ 5.98387584  1.28857441 −0.46896453]
340  [ 6.39996216  1.35605123  0.09499538]
341  [ 6.53382896  1.64894501  0.54704363]
342  [ 6.74408441  1.68858093  0.75205237]
343  [ 6.79061499  1.83586712  0.72263736]
344  [ 7.17765242  1.8429547   0.58956741]
345  [ 7.17438929  1.94636312  0.63957994]]
346 fxs: [32.95908167 37.33604141 39.45668884 42.31736381 43.21507373 48.2940132
347  48.53145662]
348 Centroid: [6.68634401 1.65819093 0.41098737]
349 x_new: [[6.19829873 1.37001875 0.1823948 ]]
350 fx_new [34.91530568]
351 Back to top
352 ————————
353 xs: [[ 5.98387584  1.28857441 −0.46896453]
354  [ 6.19829873  1.37001875  0.1823948 ]
355  [ 6.39996216  1.35605123  0.09499538]
356  [ 6.53382896  1.64894501  0.54704363]
357  [ 6.74408441  1.68858093  0.75205237]
358  [ 6.79061499  1.83586712  0.72263736]
359  [ 7.17765242  1.8429547   0.58956741]]
360 fxs: [32.95908167 34.91530568 37.33604141 39.45668884 42.31736381 43.21507373
361  48.2940132 ]
362 Centroid: [6.5469025  1.57585602 0.3456752 ]
363 x_new: [[5.91615258 1.30875734 0.101783  ]]
364 fx_new [31.63376677]
365 Expanding
366 ————————
367 xs: [[ 5.28540266  1.04165866 −0.14210921]
368  [ 5.98387584  1.28857441 −0.46896453]
369  [ 6.19829873  1.37001875  0.1823948 ]
370  [ 6.39996216  1.35605123  0.09499538]
371  [ 6.53382896  1.64894501  0.54704363]
372  [ 6.74408441  1.68858093  0.75205237]
373  [ 6.79061499  1.83586712  0.72263736]]
374 fxs: [24.88965527 32.95908167 34.91530568 37.33604141 39.45668884 42.31736381
375  43.21507373]
376 Centroid: [6.27658111 1.46138516 0.24114997]
377 x_new: [[ 5.76254722  1.0869032  −0.24033741]]
378 fx_new [29.98206034]
379 Back to top
380 ————————
381 xs: [[ 5.28540266  1.04165866 −0.14210921]
382  [ 5.76254722  1.0869032  −0.24033741]
383  [ 5.98387584  1.28857441 −0.46896453]
384  [ 6.19829873  1.37001875  0.1823948 ]
385  [ 6.39996216  1.35605123  0.09499538]
386  [ 6.53382896  1.64894501  0.54704363]
387  [ 6.74408441  1.68858093  0.75205237]]
388 fxs: [24.88965527 29.98206034 32.95908167 34.91530568 37.33604141 39.45668884
389  42.31736381]
390 Centroid: [6.12971428 1.35439031 0.10358215]
391 x_new: [[ 5.51534415  1.02019969 −0.54488808]]
392 fx_new [27.7494946]
393 Back to top
394 ————————
395 xs: [[ 5.28540266  1.04165866 −0.14210921]
396  [ 5.51534415  1.02019969 −0.54488808]
397  [ 5.76254722  1.0869032  −0.24033741]
398  [ 5.98387584  1.28857441 −0.46896453]
399  [ 6.19829873  1.37001875  0.1823948 ]
400  [ 6.39996216  1.35605123  0.09499538]
401  [ 6.53382896  1.64894501  0.54704363]]
402 fxs: [24.88965527 27.7494946  29.98206034 32.95908167 34.91530568 37.33604141
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403   39.45668884]
404  Centroid: [ 5.95417996  1.25890728  −0.08169506]
405  x_new: [[ 5.37453096  0.86886955  −0.71043376]]
406  fx_new [26.54400929]
407  Back to top
408  ————————
409  xs: [[ 5.28540266  1.04165866  −0.14210921]
410   [ 5.37453096  0.86886955  −0.71043376]
411   [ 5.51534415  1.02019969  −0.54488808]
412   [ 5.76254722  1.0869032   −0.24033741]
413   [ 5.98387584  1.28857441  −0.46896453]
414   [ 6.19829873  1.37001875   0.1823948 ]
415   [ 6.39996216  1.35605123   0.09499538]]
416  fxs: [24.88965527 26.54400929 27.7494946  29.98206034 32.95908167 34.91530568
417   37.33604141]
418  Centroid: [ 5.78856596  1.14746793  −0.26133469]
419  x_new: [[ 5.17716976  0.93888462  −0.61766476]]
420  fx_new [24.44125132]
421  Expanding
422  ————————
423  xs: [[ 4.56577356  0.73030131  −0.97399483]
424   [ 5.28540266  1.04165866  −0.14210921]
425   [ 5.37453096  0.86886955  −0.71043376]
426   [ 5.51534415  1.02019969  −0.54488808]
427   [ 5.76254722  1.0869032   −0.24033741]
428   [ 5.98387584  1.28857441  −0.46896453]
429   [ 6.19829873  1.37001875   0.1823948 ]]
430  fxs: [19.62670657 24.88965527 26.54400929 27.7494946  29.98206034 32.95908167
431   34.91530568]
432  Centroid: [ 5.52653902  1.05807508  −0.41404757]
433  x_new: [[ 4.85477931  0.74613142  −1.01048995]]
434  fx_new [22.25564936]
435  Back to top
436  ————————
437  xs: [[ 4.56577356  0.73030131  −0.97399483]
438   [ 4.85477931  0.74613142  −1.01048995]
439   [ 5.28540266  1.04165866  −0.14210921]
440   [ 5.37453096  0.86886955  −0.71043376]
441   [ 5.51534415  1.02019969  −0.54488808]
442   [ 5.76254722  1.0869032   −0.24033741]
443   [ 5.98387584  1.28857441  −0.46896453]]
444  fxs: [19.62670657 22.25564936 24.88965527 26.54400929 27.7494946  29.98206034
445   32.95908167]
446  Centroid: [ 5.33460767  0.96894832  −0.58445968]
447  x_new: [[ 4.68533951  0.64932223  −0.69995483]]
448  fx_new [20.00794303]
449  Back to top
450  ————————
451  xs: [[ 4.56577356  0.73030131  −0.97399483]
452   [ 4.68533951  0.64932223  −0.69995483]
453   [ 4.85477931  0.74613142  −1.01048995]
454   [ 5.28540266  1.04165866  −0.14210921]
455   [ 5.37453096  0.86886955  −0.71043376]
456   [ 5.51534415  1.02019969  −0.54488808]
457   [ 5.76254722  1.0869032   −0.24033741]]
458  fxs: [19.62670657 20.00794303 22.25564936 24.88965527 26.54400929 27.7494946
459   29.98206034]
460  Centroid: [ 5.14910248  0.87762658  −0.61745829]
461  x_new: [[ 4.53565774  0.66834997  −0.99457917]]
462  fx_new [19.42288491]
463  Expanding
464  ————————
465  xs: [[ 3.922213    0.45907335  −1.37170005]
466   [ 4.56577356  0.73030131  −0.97399483]
467   [ 4.68533951  0.64932223  −0.69995483]
468   [ 4.85477931  0.74613142  −1.01048995]
469   [ 5.28540266  1.04165866  −0.14210921]
470   [ 5.37453096  0.86886955  −0.71043376]
471   [ 5.51534415  1.02019969  −0.54488808]]
472  fxs: [15.83029112 19.62670657 20.00794303 22.25564936 24.88965527 26.54400929
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27.7494946 ]
Centroid: [ 4.88619759  0.7879366  -0.77908153]
x_new: [[ 4.25705104  0.55567351 -1.01327498]]
fx_new [17.22123403]
Back to top
——————————
xs: [[ 3.922213    0.45907335 -1.37170005]
 [ 4.25705104  0.55567351 -1.01327498]
 [ 4.56577356  0.73030131 -0.97399483]
 [ 4.68533951  0.64932223 -0.69995483]
 [ 4.85477931  0.74613142 -1.01048995]
 [ 5.28540266  1.04165866 -0.14210921]
 [ 5.37453096  0.86886955 -0.71043376]]
fxs: [15.83029112 17.22123403 19.62670657 20.00794303 22.25564936 24.88965527
 26.54400929]
Centroid: [ 4.70644144  0.72157572 -0.84599394]
x_new: [[ 4.03835191  0.57428189 -0.98155413]]
fx_new [15.46462662]
Expanding
——————————
xs: [[ 3.37026238  0.42698806 -1.11711432]
 [ 3.922213    0.45907335 -1.37170005]
 [ 4.25705104  0.55567351 -1.01327498]
 [ 4.56577356  0.73030131 -0.97399483]
 [ 4.68533951  0.64932223 -0.69995483]
 [ 4.85477931  0.74613142 -1.01048995]
 [ 5.28540266  1.04165866 -0.14210921]]
fxs: [11.38418225 15.83029112 17.22123403 19.62670657 20.00794303 22.25564936
 24.88965527]
Centroid: [ 4.42011735  0.65844979 -0.90409117]
x_new: [[ 3.55483204  0.27524092 -1.66607312]]
fx_new [14.52889419]
Back to top
——————————
xs: [[ 3.37026238  0.42698806 -1.11711432]
 [ 3.55483204  0.27524092 -1.66607312]
 [ 3.922213    0.45907335 -1.37170005]
 [ 4.25705104  0.55567351 -1.01327498]
 [ 4.56577356  0.73030131 -0.97399483]
 [ 4.68533951  0.64932223 -0.69995483]
 [ 4.85477931  0.74613142 -1.01048995]]
fxs: [11.38418225 14.52889419 15.83029112 17.22123403 19.62670657 20.00794303
 22.25564936]
Centroid: [ 4.17289298  0.54896154 -1.1218003 ]
x_new: [[ 3.49100664  0.35179167 -1.23311065]]
fx_new [12.52379374]
Back to top
——————————
xs: [[ 3.37026238  0.42698806 -1.11711432]
 [ 3.49100664  0.35179167 -1.23311065]
 [ 3.55483204  0.27524092 -1.66607312]
 [ 3.922213    0.45907335 -1.37170005]
 [ 4.25705104  0.55567351 -1.01327498]
 [ 4.56577356  0.73030131 -0.97399483]
 [ 4.68533951  0.64932223 -0.69995483]]
fxs: [11.38418225 12.52379374 14.52889419 15.83029112 17.22123403 19.62670657
 20.00794303]
Centroid: [ 3.97806831  0.49262729 -1.15360325]
x_new: [[ 3.27079711  0.33593236 -1.60725168]]
fx_new [12.5039488]
Back to top
——————————
xs: [[ 3.37026238  0.42698806 -1.11711432]
 [ 3.27079711  0.33593236 -1.60725168]
 [ 3.49100664  0.35179167 -1.23311065]
 [ 3.55483204  0.27524092 -1.66607312]
 [ 3.922213    0.45907335 -1.37170005]
 [ 4.25705104  0.55567351 -1.01327498]
 [ 4.56577356  0.73030131 -0.97399483]]
fxs: [11.38418225 12.5039488  12.52379374 14.52889419 15.83029112 17.22123403
```

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543   19.62670657]
544 Centroid: [ 3.77599082   0.44785731  −1.28321709]
545 x_new: [[ 2.98620809   0.16541331  −1.59243935]]
546 fx_new [10.99759982]
547 Expanding
548 ————————————
549 xs: [[ 2.19642535  −0.11703069  −1.90166161]
550  [ 3.37026238   0.42698806  −1.11711432]
551  [ 3.27079711   0.33593236  −1.60725168]
552  [ 3.49100664   0.35179167  −1.23311065]
553  [ 3.55483204   0.27524092  −1.66607312]
554  [ 3.922213     0.45907335  −1.37170005]
555  [ 4.25705104   0.55567351  −1.01327498]]
556 fxs: [ 9.08049583 11.38418225 12.5039488  12.52379374 14.52889419 15.83029112
557  17.22123403]
558 Centroid: [ 3.43751251   0.32680988  −1.41574091]
559 x_new: [[ 2.61797398   0.09794625  −1.81820685]]
560 fx_new [10.17215097]
561 Back to top
562 ————————————
563 xs: [[ 2.19642535  −0.11703069  −1.90166161]
564  [ 2.61797398   0.09794625  −1.81820685]
565  [ 3.37026238   0.42698806  −1.11711432]
566  [ 3.27079711   0.33593236  −1.60725168]
567  [ 3.49100664   0.35179167  −1.23311065]
568  [ 3.55483204   0.27524092  −1.66607312]
569  [ 3.922213     0.45907335  −1.37170005]]
570 fxs: [ 9.08049583 10.17215097 11.38418225 12.5039488  12.52379374 14.52889419
571  15.83029112]
572 Centroid: [ 3.20335864   0.26142027  −1.53073118]
573 x_new: [[ 2.48450429   0.0637672   −1.68976231]]
574 fx_new [9.08394022]
575 Back to top
576 ————————————
577 xs: [[ 2.19642535  −0.11703069  −1.90166161]
578  [ 2.48450429   0.0637672   −1.68976231]
579  [ 2.61797398   0.09794625  −1.81820685]
580  [ 3.37026238   0.42698806  −1.11711432]
581  [ 3.27079711   0.33593236  −1.60725168]
582  [ 3.49100664   0.35179167  −1.23311065]
583  [ 3.55483204   0.27524092  −1.66607312]]
584 fxs: [ 9.08049583  9.08394022 10.17215097 11.38418225 12.5039488  12.52379374
585  14.52889419]
586 Centroid: [ 2.99797168   0.20494797  −1.57616865]
587 x_new: [[ 2.44111133   0.13465501  −1.48626418]]
588 fx_new [8.03669958]
589 Expanding
590 ————————————
591 xs: [[ 1.88425098   0.06436206  −1.3963597 ]
592  [ 2.19642535  −0.11703069  −1.90166161]
593  [ 2.48450429   0.0637672   −1.68976231]
594  [ 2.61797398   0.09794625  −1.81820685]
595  [ 3.37026238   0.42698806  −1.11711432]
596  [ 3.27079711   0.33593236  −1.60725168]
597  [ 3.49100664   0.35179167  −1.23311065]]
598 fxs: [ 5.75995437  9.08049583  9.08394022 10.17215097 11.38418225 12.5039488
599  12.52379374]
600 Centroid: [ 2.75931725   0.17482242  −1.53763816]
601 x_new: [[ 2.02762785  −0.00214684  −1.84216567]]
602 fx_new [8.05074134]
603 Back to top
604 ————————————
605 xs: [[ 1.88425098e+00   6.43620596e−02  −1.39635970e+00]
606  [ 2.02762785e+00  −2.14683898e−03  −1.84216567e+00]
607  [ 2.19642535e+00  −1.17030690e−01  −1.90166161e+00]
608  [ 2.48450429e+00   6.37671993e−02  −1.68976231e+00]
609  [ 2.61797398e+00   9.79462535e−02  −1.81820685e+00]
610  [ 3.37026238e+00   4.26988061e−01  −1.11711432e+00]
611  [ 3.27079711e+00   3.35932355e−01  −1.60725168e+00]]
612 fxs: [ 5.75995437   8.05074134   9.08049583   9.08394022 10.17215097 11.38418225
```

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613  12.5039488 ]
614  Centroid: [ 2.55026313  0.12425977 −1.62464602]
615  x_new: [[ 1.82972916 −0.08741281 −1.64204037]]
616  fx_new [6.70993757]
617  Back to top
618  ————————
619  xs: [[ 1.88425098e+00  6.43620596e−02 −1.39635970e+00]
620   [ 1.82972916e+00 −8.74128124e−02 −1.64204037e+00]
621   [ 2.02762785e+00 −2.14683898e−03 −1.84216567e+00]
622   [ 2.19642535e+00 −1.17030690e−01 −1.90166161e+00]
623   [ 2.48450429e+00  6.37671993e−02 −1.68976231e+00]
624   [ 2.61797398e+00  9.79462535e−02 −1.81820685e+00]
625   [ 3.37026238e+00  4.26988061e−01 −1.11711432e+00]]
626  fxs: [ 5.75995437  6.70993757  8.05074134  9.08049583  9.08394022 10.17215097
627   11.38418225]
628  Centroid: [ 2.34439628  0.06378189 −1.62961583]
629  x_new: [[ 1.31853019 −0.29942428 −2.14211735]]
630  fx_new [8.03180065]
631  Back to top
632  ————————
633  xs: [[ 1.88425098e+00  6.43620596e−02 −1.39635970e+00]
634   [ 1.82972916e+00 −8.74128124e−02 −1.64204037e+00]
635   [ 1.31853019e+00 −2.99424281e−01 −2.14211735e+00]
636   [ 2.02762785e+00 −2.14683898e−03 −1.84216567e+00]
637   [ 2.19642535e+00 −1.17030690e−01 −1.90166161e+00]
638   [ 2.48450429e+00  6.37671993e−02 −1.68976231e+00]
639   [ 2.61797398e+00  9.79462535e−02 −1.81820685e+00]]
640  fxs: [ 5.75995437  6.70993757  8.03180065  8.05074134  9.08049583  9.08394022
641   10.17215097]
642  Centroid: [ 2.05129168 −0.0399913  −1.77604484]
643  x_new: [[ 1.48460939 −0.17792886 −1.73388282]]
644  fx_new [6.31216079]
645  Back to top
646  ————————
647  xs: [[ 1.88425098e+00  6.43620596e−02 −1.39635970e+00]
648   [ 1.48460939e+00 −1.77928856e−01 −1.73388282e+00]
649   [ 1.82972916e+00 −8.74128124e−02 −1.64204037e+00]
650   [ 1.31853019e+00 −2.99424281e−01 −2.14211735e+00]
651   [ 2.02762785e+00 −2.14683898e−03 −1.84216567e+00]
652   [ 2.19642535e+00 −1.17030690e−01 −1.90166161e+00]
653   [ 2.48450429e+00  6.37671993e−02 −1.68976231e+00]]
654  fxs: [5.75995437 6.31216079 6.70993757 8.03180065 8.05074134 9.08049583
655   9.08394022]
656  Centroid: [ 1.88938246 −0.07940203 −1.76399855]
657  x_new: [[ 1.29426063 −0.22257126 −1.83823479]]
658  fx_new [6.42983345]
659  Back to top
660  ————————
661  xs: [[ 1.88425098e+00  6.43620596e−02 −1.39635970e+00]
662   [ 1.48460939e+00 −1.77928856e−01 −1.73388282e+00]
663   [ 1.29426063e+00 −2.22571262e−01 −1.83823479e+00]
664   [ 1.82972916e+00 −8.74128124e−02 −1.64204037e+00]
665   [ 1.31853019e+00 −2.99424281e−01 −2.14211735e+00]
666   [ 2.02762785e+00 −2.14683898e−03 −1.84216567e+00]
667   [ 2.19642535e+00 −1.17030690e−01 −1.90166161e+00]]
668  fxs: [5.75995437 6.31216079 6.42983345 6.70993757 8.03180065 8.05074134
669   9.08049583]
670  Centroid: [ 1.71934765 −0.12030753 −1.7852089 ]
671  x_new: [[ 1.24226994 −0.12358436 −1.66875619]]
672  fx_new [5.45902491]
673  Expanding
674  ————————
675  xs: [[ 0.76519224 −0.1268612  −1.55230348]
676   [ 1.88425098  0.06436206 −1.3963597 ]
677   [ 1.48460939 −0.17792886 −1.73388282]
678   [ 1.29426063 −0.22257126 −1.83823479]
679   [ 1.82972916 −0.08741281 −1.64204037]
680   [ 1.31853019 −0.29942428 −2.14211735]
681   [ 2.02762785 −0.00214684 −1.84216567]]
682  fxs: [4.37181478 5.75995437 6.31216079 6.42983345 6.70993757 8.03180065
```

26

```
683    8.05074134]
684  Centroid: [ 1.51488577 −0.12171188 −1.7353006 ]
685  x_new: [[ 1.0021437  −0.24127693 −1.62843552]]
686  fx_new [5.12020592]
687  Back to top
688  ————————————
689  xs: [[ 0.76519224 −0.1268612  −1.55230348]
690   [ 1.0021437  −0.24127693 −1.62843552]
691   [ 1.88425098  0.06436206 −1.3963597 ]
692   [ 1.48460939 −0.17792886 −1.73388282]
693   [ 1.29426063 −0.22257126 −1.83823479]
694   [ 1.82972916 −0.08741281 −1.64204037]
695   [ 1.31853019 −0.29942428 −2.14211735]]
696  fxs: [4.37181478 5.12020592 5.75995437 6.31216079 6.42983345 6.70993757
697   8.03180065]
698  Centroid: [ 1.36838804 −0.15587333 −1.70476772]
699  x_new: [[ 1.41824589 −0.01232237 −1.26741809]]
700  fx_new [4.20046648]
701  Expanding
702  ————————————
703  xs: [[ 1.46810374  0.13122858 −0.83006846]
704   [ 0.76519224 −0.1268612  −1.55230348]
705   [ 1.0021437  −0.24127693 −1.62843552]
706   [ 1.88425098  0.06436206 −1.3963597 ]
707   [ 1.48460939 −0.17792886 −1.73388282]
708   [ 1.29426063 −0.22257126 −1.83823479]
709   [ 1.82972916 −0.08741281 −1.64204037]]
710  fxs: [2.92790154 4.37181478 5.12020592 5.75995437 6.31216079 6.42983345
711   6.70993757]
712  Centroid: [ 1.38975569 −0.09435149 −1.51733216]
713  x_new: [[ 0.94978222 −0.10129016 −1.39262396]]
714  fx_new [3.9486955]
715  Back to top
716  ————————————
717  xs: [[ 1.46810374  0.13122858 −0.83006846]
718   [ 0.94978222 −0.10129016 −1.39262396]
719   [ 0.76519224 −0.1268612  −1.55230348]
720   [ 1.0021437  −0.24127693 −1.62843552]
721   [ 1.88425098  0.06436206 −1.3963597 ]
722   [ 1.48460939 −0.17792886 −1.73388282]
723   [ 1.29426063 −0.22257126 −1.83823479]]
724  fxs: [2.92790154 3.9486955  4.37181478 5.12020592 5.75995437 6.31216079
725   6.42983345]
726  Centroid: [ 1.26404898 −0.09633397 −1.48170125]
727  x_new: [[ 1.23383734  0.02990333 −1.12516771]]
728  fx_new [3.34360031]
729  Back to top
730  ————————————
731  xs: [[ 1.46810374  0.13122858 −0.83006846]
732   [ 1.23383734  0.02990333 −1.12516771]
733   [ 0.94978222 −0.10129016 −1.39262396]
734   [ 0.76519224 −0.1268612  −1.55230348]
735   [ 1.0021437  −0.24127693 −1.62843552]
736   [ 1.88425098  0.06436206 −1.3963597 ]
737   [ 1.48460939 −0.17792886 −1.73388282]]
738  fxs: [2.92790154 3.34360031 3.9486955  4.37181478 5.12020592 5.75995437
739   6.31216079]
740  Centroid: [ 1.25541709 −0.06026617 −1.37983452]
741  x_new: [[ 1.02622479  0.05739652 −1.02578622]]
742  fx_new [2.69851463]
743  Expanding
744  ————————————
745  xs: [[ 0.79703249  0.17505921 −0.67173792]
746   [ 1.46810374  0.13122858 −0.83006846]
747   [ 1.23383734  0.02990333 −1.12516771]
748   [ 0.94978222 −0.10129016 −1.39262396]
749   [ 0.76519224 −0.1268612  −1.55230348]
750   [ 1.0021437  −0.24127693 −1.62843552]
751   [ 1.88425098  0.06436206 −1.3963597 ]]
752  fxs: [1.46686301 2.92790154 3.34360031 3.9486955  4.37181478 5.12020592
```

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753  5.75995437]
754  Centroid: [ 1.15719181 -0.0098393  -1.22809954]
755  x_new: [[ 0.43013265 -0.08404066 -1.05983937]]
756  fx_new [2.51386177]
757  Back to top
758  ―――――――――――
759  xs: [[ 0.79703249  0.17505921 -0.67173792]
760   [ 0.43013265 -0.08404066 -1.05983937]
761   [ 1.46810374  0.13122858 -0.83006846]
762   [ 1.23383734  0.02990333 -1.12516771]
763   [ 0.94978222 -0.10129016 -1.39262396]
764   [ 0.76519224 -0.1268612  -1.55230348]
765   [ 1.0021437  -0.24127693 -1.62843552]]
766  fxs: [1.46686301 2.51386177 2.92790154 3.34360031 3.9486955  4.37181478
767   5.12020592]
768  Centroid: [ 0.94946063 -0.03103969 -1.1800252 ]
769  x_new: [[ 0.89677755  0.17919755 -0.73161488]]
770  fx_new [1.68921023]
771  Back to top
772  ―――――――――――
773  xs: [[ 0.79703249  0.17505921 -0.67173792]
774   [ 0.89677755  0.17919755 -0.73161488]
775   [ 0.43013265 -0.08404066 -1.05983937]
776   [ 1.46810374  0.13122858 -0.83006846]
777   [ 1.23383734  0.02990333 -1.12516771]
778   [ 0.94978222 -0.10129016 -1.39262396]
779   [ 0.76519224 -0.1268612  -1.55230348]]
780  fxs: [1.46686301 1.68921023 2.51386177 2.92790154 3.34360031 3.9486955
781   4.37181478]
782  Centroid: [ 0.93440832  0.02902809 -1.05190797]
783  x_new: [[ 1.1036244   0.18491738 -0.55151245]]
784  fx_new [1.60838277]
785  Back to top
786  ―――――――――――
787  xs: [[ 0.79703249  0.17505921 -0.67173792]
788   [ 1.1036244   0.18491738 -0.55151245]
789   [ 0.89677755  0.17919755 -0.73161488]
790   [ 0.43013265 -0.08404066 -1.05983937]
791   [ 1.46810374  0.13122858 -0.83006846]
792   [ 1.23383734  0.02990333 -1.12516771]
793   [ 0.94978222 -0.10129016 -1.39262396]]
794  fxs: [1.46686301 1.60838277 1.68921023 2.51386177 2.92790154 3.34360031
795   3.9486955 ]
796  Centroid: [ 0.98275577  0.07356789 -0.90893782]
797  x_new: [[ 1.01572932  0.24842594 -0.42525168]]
798  fx_new [1.21604081]
799  Expanding
800  ―――――――――――
801  xs: [[ 1.04870287  0.423284    0.05843446]
802   [ 0.79703249  0.17505921 -0.67173792]
803   [ 1.1036244   0.18491738 -0.55151245]
804   [ 0.89677755  0.17919755 -0.73161488]
805   [ 0.43013265 -0.08404066 -1.05983937]
806   [ 1.46810374  0.13122858 -0.83006846]
807   [ 1.23383734  0.02990333 -1.12516771]]
808  fxs: [0.64655809 1.46686301 1.60838277 1.68921023 2.51386177 2.92790154
809   3.34360031]
810  Centroid: [ 0.99688729  0.14850706 -0.70164376]
811  x_new: [[ 0.75993724  0.26711078 -0.27811981]]
812  fx_new [0.71551075]
813  Back to top
814  ―――――――――――
815  xs: [[ 1.04870287  0.423284    0.05843446]
816   [ 0.75993724  0.26711078 -0.27811981]
817   [ 0.79703249  0.17505921 -0.67173792]
818   [ 1.1036244   0.18491738 -0.55151245]
819   [ 0.89677755  0.17919755 -0.73161488]
820   [ 0.43013265 -0.08404066 -1.05983937]
821   [ 1.46810374  0.13122858 -0.83006846]]
822  fxs: [0.64655809 0.71551075 1.46686301 1.60838277 1.68921023 2.51386177
```

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823   2.92790154]
824  Centroid: [ 0.92918728  0.18239384 −0.58063692]
825  x_new: [[ 0.39027082  0.23355909 −0.33120538]]
826  fx_new [0.63243576]
827  Expanding
828  ————————————
829  xs: [[−0.14864565  0.28472434 −0.08177384]
830   [ 1.04870287  0.423284     0.05843446]
831   [ 0.75993724  0.26711078 −0.27811981]
832   [ 0.79703249  0.17505921 −0.67173792]
833   [ 1.1036244   0.18491738 −0.55151245]
834   [ 0.89677755  0.17919755 −0.73161488]
835   [ 0.43013265 −0.08404066 −1.05983937]]
836  fxs: [0.55049765 0.64655809 0.71551075 1.46686301 1.60838277 1.68921023
837   2.51386177]
838  Centroid: [ 0.69822308  0.2043218  −0.47373769]
839  x_new: [[0.96631351 0.49268426 0.11236399]]
840  fx_new [0.47976123]
841  Expanding
842  ————————————
843  xs: [[ 0.96631351  0.49268426  0.11236399]
844   [−0.14864565  0.28472434 −0.08177384]
845   [ 1.04870287  0.423284     0.05843446]
846   [ 0.75993724  0.26711078 −0.27811981]
847   [ 0.79703249  0.17505921 −0.67173792]
848   [ 1.1036244   0.18491738 −0.55151245]
849   [ 0.89677755  0.17919755 −0.73161488]]
850  fxs: [0.47976123 0.55049765 0.64655809 0.71551075 1.46686301 1.60838277
851   1.68921023]
852  Centroid: [ 0.77482035  0.28671108 −0.30628007]
853  x_new: [[0.65286314 0.3942246  0.11905475]]
854  fx_new [0.22223929]
855  Expanding
856  ————————————
857  xs: [[ 0.53090593  0.50173813  0.54438956]
858   [ 0.96631351  0.49268426  0.11236399]
859   [−0.14864565  0.28472434 −0.08177384]
860   [ 1.04870287  0.423284     0.05843446]
861   [ 0.75993724  0.26711078 −0.27811981]
862   [ 0.79703249  0.17505921 −0.67173792]
863   [ 1.1036244   0.18491738 −0.55151245]]
864  fxs: [0.11078109 0.47976123 0.55049765 0.64655809 0.71551075 1.46686301
865   1.60838277]
866  Centroid: [ 0.72255297  0.3327883  −0.12399372]
867  x_new: [[0.34148154 0.48065922 0.30352502]]
868  fx_new [0.0355537]
869  Expanding
870  ————————————
871  xs: [[ 0.34148154  0.48065922  0.30352502]
872   [ 0.53090593  0.50173813  0.54438956]
873   [ 0.96631351  0.49268426  0.11236399]
874   [−0.14864565  0.28472434 −0.08177384]
875   [ 1.04870287  0.423284     0.05843446]
876   [ 0.75993724  0.26711078 −0.27811981]
877   [ 0.79703249  0.17505921 −0.67173792]]
878  fxs: [0.0355537  0.11078109 0.47976123 0.55049765 0.64655809 0.71551075
879   1.46686301]
880  Centroid: [ 0.61367542  0.37503713 −0.00184551]
881  x_new: [[0.43031835 0.57501506 0.66804691]]
882  fx_new [0.12983929]
883  Back to top
884  ————————————
885  xs: [[ 0.34148154  0.48065922  0.30352502]
886   [ 0.53090593  0.50173813  0.54438956]
887   [ 0.43031835  0.57501506  0.66804691]
888   [ 0.96631351  0.49268426  0.11236399]
889   [−0.14864565  0.28472434 −0.08177384]
890   [ 1.04870287  0.423284     0.05843446]
891   [ 0.75993724  0.26711078 −0.27811981]]
892  fxs: [0.0355537   0.11078109 0.12983929 0.47976123 0.55049765 0.64655809
```

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893  0.71551075]
894  Centroid: [0.56128769 0.43217368 0.18955233]
895  x_new: [[0.36263813 0.59723658 0.65722447]]
896  fx_new [0.11058477]
897  Back to top
898  ——————————
899  xs: [[ 0.34148154   0.48065922   0.30352502]
900   [ 0.36263813   0.59723658   0.65722447]
901   [ 0.53090593   0.50173813   0.54438956]
902   [ 0.43031835   0.57501506   0.66804691]
903   [ 0.96631351   0.49268426   0.11236399]
904   [-0.14864565   0.28472434  -0.08177384]
905   [ 1.04870287   0.423284      0.05843446]]
906  fxs: [0.0355537  0.11058477 0.11078109 0.12983929 0.47976123 0.55049765
907   0.64655809]
908  Centroid: [0.50453067 0.47933451 0.32317294]
909  x_new: [[-0.03964153   0.53538502   0.58791142]]
910  fx_new [0.22115512]
911  Back to top
912  ——————————
913  xs: [[ 0.34148154   0.48065922   0.30352502]
914   [ 0.36263813   0.59723658   0.65722447]
915   [ 0.53090593   0.50173813   0.54438956]
916   [ 0.43031835   0.57501506   0.66804691]
917   [-0.03964153   0.53538502   0.58791142]
918   [ 0.96631351   0.49268426   0.11236399]
919   [-0.14864565   0.28472434  -0.08177384]]
920  fxs: [0.0355537  0.11058477 0.11078109 0.12983929 0.22115512 0.47976123
921   0.55049765]
922  Centroid: [0.3490529  0.49534894 0.3988125 ]
923  x_new: [[0.84675144 0.70597355 0.87939885]]
924  fx_new [0.56333073]
925  Contracting
926  ——————————
927  xs: [[ 0.34148154   0.48065922   0.30352502]
928   [ 0.19974333   0.43216156   0.2546366 ]
929   [ 0.36263813   0.59723658   0.65722447]
930   [ 0.53090593   0.50173813   0.54438956]
931   [ 0.43031835   0.57501506   0.66804691]
932   [-0.03964153   0.53538502   0.58791142]
933   [ 0.96631351   0.49268426   0.11236399]]
934  fxs: [0.0355537  0.07903211 0.11058477 0.11078109 0.12983929 0.22115512
935   0.47976123]
936  Centroid: [0.39882275 0.5164114  0.44687114]
937  x_new: [[-0.16866801   0.54013855   0.78137828]]
938  fx_new [0.46875899]
939  Back to top
940  ——————————
941  xs: [[ 0.34148154   0.48065922   0.30352502]
942   [ 0.19974333   0.43216156   0.2546366 ]
943   [ 0.36263813   0.59723658   0.65722447]
944   [ 0.53090593   0.50173813   0.54438956]
945   [ 0.43031835   0.57501506   0.66804691]
946   [-0.03964153   0.53538502   0.58791142]
947   [-0.16866801   0.54013855   0.78137828]]
948  fxs: [0.0355537  0.07903211 0.11058477 0.11078109 0.12983929 0.22115512
949   0.46875899]
950  Centroid: [0.23668253 0.52319059 0.54244461]
951  x_new: [[0.64203307 0.50624263 0.30351093]]
952  fx_new [0.12192078]
953  Back to top
954  ——————————
955  xs: [[ 0.34148154   0.48065922   0.30352502]
956   [ 0.19974333   0.43216156   0.2546366 ]
957   [ 0.36263813   0.59723658   0.65722447]
958   [ 0.53090593   0.50173813   0.54438956]
959   [ 0.64203307   0.50624263   0.30351093]
960   [ 0.43031835   0.57501506   0.66804691]
961   [-0.03964153   0.53538502   0.58791142]]
962  fxs: [0.0355537   0.07903211 0.11058477 0.11078109 0.12192078 0.12983929
```

```
963    0.22115512]
964  Centroid: [0.35249697 0.51834831 0.47417784]
965  x_new: [[0.74463548 0.5013116  0.36044427]]
966  fx_new [0.19724676]
967  Back to top
968  ————————————
969  xs: [[0.34148154 0.48065922 0.30352502]
970   [0.19974333 0.43216156 0.2546366 ]
971   [0.36263813 0.59723658 0.65722447]
972   [0.53090593 0.50173813 0.54438956]
973   [0.64203307 0.50624263 0.30351093]
974   [0.43031835 0.57501506 0.66804691]
975   [0.74463548 0.5013116  0.36044427]]
976  fxs: [0.0355537  0.07903211 0.11058477 0.11078109 0.12192078 0.12983929
977   0.19724676]
978  Centroid: [0.46453655 0.51348068 0.44168254]
979  x_new: [[0.18443761 0.52564976 0.5229208 ]]
980  fx_new [0.07799911]
981  Back to top
982  ————————————
983  xs: [[0.34148154 0.48065922 0.30352502]
984   [0.18443761 0.52564976 0.5229208 ]
985   [0.19974333 0.43216156 0.2546366 ]
986   [0.36263813 0.59723658 0.65722447]
987   [0.53090593 0.50173813 0.54438956]
988   [0.64203307 0.50624263 0.30351093]
989   [0.43031835 0.57501506 0.66804691]]
990  fxs: [0.0355537  0.07799911 0.07903211 0.11058477 0.11078109 0.12192078
991   0.12983929]
992  Centroid: [0.38450828 0.51695756 0.46489347]
993  x_new: [[0.33869821 0.45890007 0.26174003]]
994  fx_new [0.04832134]
995  Back to top
996  ————————————
997  xs: [[0.34148154 0.48065922 0.30352502]
998   [0.33869821 0.45890007 0.26174003]
999   [0.18443761 0.52564976 0.5229208 ]
1000   [0.19974333 0.43216156 0.2546366 ]
1001   [0.36263813 0.59723658 0.65722447]
1002   [0.53090593 0.50173813 0.54438956]
1003   [0.64203307 0.50624263 0.30351093]]
1004  fxs: [0.0355537  0.04832134 0.07799911 0.07903211 0.11058477 0.11078109
1005   0.12192078]
1006  Centroid: [0.37141969 0.50036971 0.40684963]
1007  x_new: [[0.10080631 0.49449678 0.51018833]]
1008  fx_new [0.11498898]
1009  Back to top
1010  ————————————
1011  xs: [[0.34148154 0.48065922 0.30352502]
1012   [0.33869821 0.45890007 0.26174003]
1013   [0.18443761 0.52564976 0.5229208 ]
1014   [0.19974333 0.43216156 0.2546366 ]
1015   [0.36263813 0.59723658 0.65722447]
1016   [0.53090593 0.50173813 0.54438956]
1017   [0.10080631 0.49449678 0.51018833]]
1018  fxs: [0.0355537  0.04832134 0.07799911 0.07903211 0.11058477 0.11078109
1019   0.11498898]
1020  Centroid: [0.29410158 0.49869173 0.43637497]
1021  x_new: [[0.48739686 0.50288667 0.36256162]]
1022  fx_new [0.05141375]
1023  Back to top
1024  ————————————
1025  xs: [[0.34148154 0.48065922 0.30352502]
1026   [0.33869821 0.45890007 0.26174003]
1027   [0.48739686 0.50288667 0.36256162]
1028   [0.18443761 0.52564976 0.5229208 ]
1029   [0.19974333 0.43216156 0.2546366 ]
1030   [0.36263813 0.59723658 0.65722447]
1031   [0.53090593 0.50173813 0.54438956]]
1032  fxs: [0.0355537  0.04832134 0.05141375 0.07799911 0.07903211 0.11058477
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  0.11078109]
Centroid: [0.3493288   0.49989028 0.41528544]
x_new: [[0.16775167 0.49804244 0.28618132]]
fx_new [0.05807473]
Back to top
—————————
xs: [[0.34148154 0.48065922 0.30352502]
 [0.33869821 0.45890007 0.26174003]
 [0.48739686 0.50288667 0.36256162]
 [0.16775167 0.49804244 0.28618132]
 [0.18443761 0.52564976 0.5229208 ]
 [0.19974333 0.43216156 0.2546366 ]
 [0.36263813 0.59723658 0.65722447]]
fxs: [0.0355537  0.04832134 0.05141375 0.05807473 0.07799911 0.07903211
  0.11058477]
Centroid: [0.29744962 0.49936233 0.37839855]
x_new: [[0.23226112 0.40148808 0.09957264]]
fx_new [0.13517934]
Contracting
—————————
xs: [[0.34148154 0.48065922 0.30352502]
 [0.31700617 0.52872461 0.46204633]
 [0.33869821 0.45890007 0.26174003]
 [0.48739686 0.50288667 0.36256162]
 [0.16775167 0.49804244 0.28618132]
 [0.18443761 0.52564976 0.5229208 ]
 [0.19974333 0.43216156 0.2546366 ]]
fxs: [0.0355537  0.03586162 0.04832134 0.05141375 0.05807473 0.07799911
  0.07903211]
Centroid: [0.29093077 0.4895749  0.35051596]
x_new: [[0.38211821 0.54698825 0.44639532]]
fx_new [0.0294859]
Expanding
—————————
xs: [[0.38211821 0.54698825 0.44639532]
 [0.34148154 0.48065922 0.30352502]
 [0.31700617 0.52872461 0.46204633]
 [0.33869821 0.45890007 0.26174003]
 [0.48739686 0.50288667 0.36256162]
 [0.16775167 0.49804244 0.28618132]
 [0.18443761 0.52564976 0.5229208 ]]
fxs: [0.0294859  0.0355537  0.03586162 0.04832134 0.05141375 0.05807473
  0.07799911]
Centroid: [0.31698433 0.50597872 0.37791006]
x_new: [[0.44953104 0.48630767 0.23289932]]
fx_new [0.05611826]
Back to top
—————————
xs: [[0.38211821 0.54698825 0.44639532]
 [0.34148154 0.48065922 0.30352502]
 [0.31700617 0.52872461 0.46204633]
 [0.33869821 0.45890007 0.26174003]
 [0.48739686 0.50288667 0.36256162]
 [0.44953104 0.48630767 0.23289932]
 [0.16775167 0.49804244 0.28618132]]
fxs: [0.0294859  0.0355537  0.03586162 0.04832134 0.05141375 0.05611826
  0.05807473]
Centroid: [0.35485481 0.50035842 0.33647842]
x_new: [[0.54195796 0.50267439 0.38677553]]
fx_new [0.07327377]
Contracting
—————————
xs: [[0.29872387 0.49966362 0.32138929]
 [0.38211821 0.54698825 0.44639532]
 [0.34148154 0.48065922 0.30352502]
 [0.31700617 0.52872461 0.46204633]
 [0.33869821 0.45890007 0.26174003]
 [0.48739686 0.50288667 0.36256162]
 [0.44953104 0.48630767 0.23289932]]
fxs: [0.02923049 0.0294859  0.0355537  0.03586162 0.04832134 0.05141375
```

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  0.05611826]
Centroid: [0.37356513 0.50059001 0.34150813]
x_new: [[0.29759922 0.51487236 0.45011694]]
fx_new [0.03795685]
Back to top
————————
xs: [[0.29872387 0.49966362 0.32138929]
 [0.38211821 0.54698825 0.44639532]
 [0.34148154 0.48065922 0.30352502]
 [0.31700617 0.52872461 0.46204633]
 [0.29759922 0.51487236 0.45011694]
 [0.33869821 0.45890007 0.26174003]
 [0.48739686 0.50288667 0.36256162]]
fxs: [0.02923049 0.0294859  0.0355537  0.03586162 0.03795685 0.04832134
 0.05141375]
Centroid: [0.35186058 0.50467068 0.37253922]
x_new: [[0.21632431 0.5064547  0.38251683]]
fx_new [0.041778]
Back to top
————————
xs: [[0.29872387 0.49966362 0.32138929]
 [0.38211821 0.54698825 0.44639532]
 [0.34148154 0.48065922 0.30352502]
 [0.31700617 0.52872461 0.46204633]
 [0.29759922 0.51487236 0.45011694]
 [0.21632431 0.5064547  0.38251683]
 [0.33869821 0.45890007 0.26174003]]
fxs: [0.02923049 0.0294859  0.0355537  0.03586162 0.03795685 0.041778
 0.04832134]
Centroid: [0.31313593 0.5051804  0.37538997]
x_new: [[0.28757366 0.55146074 0.4890399 ]]
fx_new [0.03961089]
Back to top
————————
xs: [[0.29872387 0.49966362 0.32138929]
 [0.38211821 0.54698825 0.44639532]
 [0.34148154 0.48065922 0.30352502]
 [0.31700617 0.52872461 0.46204633]
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 [0.28757366 0.55146074 0.4890399 ]
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fxs: [0.02923049 0.0294859  0.0355537  0.03586162 0.03795685 0.03961089
 0.041778  ]
Centroid: [0.30583243 0.51840335 0.40786138]
x_new: [[0.39534054 0.53035201 0.43320592]]
fx_new [0.03240111]
Back to top
————————
xs: [[0.29872387 0.49966362 0.32138929]
 [0.38211821 0.54698825 0.44639532]
 [0.39534054 0.53035201 0.43320592]
 [0.34148154 0.48065922 0.30352502]
 [0.31700617 0.52872461 0.46204633]
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 [0.28757366 0.55146074 0.4890399 ]]
fxs: [0.02923049 0.0294859  0.03240111 0.0355537  0.03586162 0.03795685
 0.03961089]
Centroid: [0.33140617 0.52181726 0.41510268]
x_new: [[0.37523869 0.49217378 0.34116545]]
fx_new [0.03226517]
Back to top
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xs: [[0.29872387 0.49966362 0.32138929]
 [0.38211821 0.54698825 0.44639532]
 [0.37523869 0.49217378 0.34116545]
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fxs: [0.02923049 0.0294859  0.03226517 0.03240111 0.0355537  0.03586162
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  0.03795685]
Centroid: [0.34392975 0.51334769 0.39397775]
x_new: [[0.39026028 0.51182302 0.33783857]]
fx_new [0.02723753]
Expanding
————————————
xs: [[0.39026028 0.51182302 0.33783857]
 [0.29872387 0.49966362 0.32138929]
 [0.38211821 0.54698825 0.44639532]
 [0.37523869 0.49217378 0.34116545]
 [0.39534054 0.53035201 0.43320592]
 [0.34148154 0.48065922 0.30352502]
 [0.31700617 0.52872461 0.46204633]]
fxs: [0.02723753 0.02923049 0.0294859  0.03226517 0.03240111 0.0355537
 0.03586162]
Centroid: [0.35716704 0.51291207 0.37793799]
x_new: [[0.39732791 0.49709954 0.29382965]]
fx_new [0.03440886]
Back to top
————————————
xs: [[0.39026028 0.51182302 0.33783857]
 [0.29872387 0.49966362 0.32138929]
 [0.38211821 0.54698825 0.44639532]
 [0.37523869 0.49217378 0.34116545]
 [0.39534054 0.53035201 0.43320592]
 [0.39732791 0.49709954 0.29382965]
 [0.34148154 0.48065922 0.30352502]]
fxs: [0.02723753 0.02923049 0.0294859  0.03226517 0.03240111 0.03440886
 0.0355537 ]
Centroid: [0.36864158 0.50839421 0.35390703]
x_new: [[0.39580162 0.5361292  0.40428904]]
fx_new [0.02597703]
Expanding
————————————
xs: [[0.39580162 0.5361292  0.40428904]
 [0.39026028 0.51182302 0.33783857]
 [0.29872387 0.49966362 0.32138929]
 [0.38211821 0.54698825 0.44639532]
 [0.37523869 0.49217378 0.34116545]
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 [0.39732791 0.49709954 0.29382965]]
fxs: [0.02597703 0.02723753 0.02923049 0.0294859  0.03226517 0.03240111
 0.03440886]
Centroid: [0.37640159 0.51631849 0.36830189]
x_new: [[0.35547526 0.53553744 0.44277414]]
fx_new [0.02966243]
Back to top
————————————
xs: [[0.39580162 0.5361292  0.40428904]
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 [0.38211821 0.54698825 0.44639532]
 [0.35547526 0.53553744 0.44277414]
 [0.37523869 0.49217378 0.34116545]
 [0.39534054 0.53035201 0.43320592]]
fxs: [0.02597703 0.02723753 0.02923049 0.0294859  0.02966243 0.03226517
 0.03240111]
Centroid: [0.37042264 0.52180962 0.38957968]
x_new: [[0.34550474 0.51326722 0.34595343]]
fx_new [0.0238388]
Expanding
————————————
xs: [[0.34550474 0.51326722 0.34595343]
 [0.39580162 0.5361292  0.40428904]
 [0.39026028 0.51182302 0.33783857]
 [0.29872387 0.49966362 0.32138929]
 [0.38211821 0.54698825 0.44639532]
 [0.35547526 0.53553744 0.44277414]
 [0.37523869 0.49217378 0.34116545]]
fxs: [0.0238388  0.02597703 0.02723753 0.02923049 0.0294859  0.02966243
```

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Centroid: [0.36330324 0.51936893 0.37711503]
x_new: [[0.35136779 0.54656409 0.41306462]]
fx_new [0.02110695]
Expanding
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xs: [[0.35136779 0.54656409 0.41306462]
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 [0.39580162 0.5361292  0.40428904]
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fxs: [0.02110695 0.0238388  0.02597703 0.02723753 0.02923049 0.0294859
 0.02966243]
Centroid: [0.35989311 0.52713898 0.38738634]
x_new: [[0.36431095 0.51874052 0.33199855]]
fx_new [0.02284354]
Back to top
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xs: [[0.35136779 0.54656409 0.41306462]
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 [0.38211821 0.54698825 0.44639532]]
fxs: [0.02110695 0.02284354 0.0238388  0.02597703 0.02723753 0.02923049
 0.0294859 ]
Centroid: [0.36115535 0.52473942 0.37156126]
x_new: [[0.34019249 0.50249059 0.2967272 ]]
fx_new [0.02834084]
Back to top
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xs: [[0.35136779 0.54656409 0.41306462]
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fxs: [0.02110695 0.02284354 0.0238388  0.02597703 0.02723753 0.02834084
 0.02923049]
Centroid: [0.35516596 0.51838261 0.3501801 ]
x_new: [[0.41160805 0.53710159 0.37897091]]
fx_new [0.02499683]
Back to top
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xs: [[0.35136779 0.54656409 0.41306462]
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 [0.34019249 0.50249059 0.2967272 ]]
fxs: [0.02110695 0.02284354 0.0238388  0.02499683 0.02597703 0.02723753
 0.02834084]
Centroid: [0.37129227 0.52373089 0.35840604]
x_new: [[0.40239206 0.54497119 0.42008489]]
fx_new [0.02710473]
Back to top
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xs: [[0.35136779 0.54656409 0.41306462]
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fxs: [0.02110695 0.02284354 0.0238388  0.02499683 0.02597703 0.02710473
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0.02723753]
Centroid: [0.38017793 0.52979955 0.37602857]
x_new: [[0.37009557 0.54777607 0.41421858]]
fx_new [0.02202886]
Back to top
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xs: [[0.35136779 0.54656409 0.41306462]
 [0.37009557 0.54777607 0.41421858]
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fxs: [0.02110695 0.02202886 0.02284354 0.0238388  0.02499683 0.02597703
 0.02710473]
Centroid: [0.37729725 0.5349357  0.38694   ]
x_new: [[0.35220245 0.5249002  0.35379511]]
fx_new [0.02087246]
Expanding
————————
xs: [[0.35220245 0.5249002  0.35379511]
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 [0.34550474 0.51326722 0.34595343]
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 [0.39580162 0.5361292  0.40428904]]
fxs: [0.02087246 0.02110695 0.02202886 0.02284354 0.0238388  0.02499683
 0.02597703]
Centroid: [0.37012731 0.53206841 0.37747003]
x_new: [[0.344453   0.52800763 0.35065103]]
fx_new [0.01964988]
Expanding
————————
xs: [[0.344453   0.52800763 0.35065103]
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 [0.35136779 0.54656409 0.41306462]
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 [0.41160805 0.53710159 0.37897091]]
fxs: [0.01964988 0.02087246 0.02110695 0.02202886 0.02284354 0.0238388
 0.02499683]
Centroid: [0.36279179 0.53090819 0.36980746]
x_new: [[0.31397554 0.52471478 0.36064401]]
fx_new [0.02127093]
Back to top
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xs: [[0.344453   0.52800763 0.35065103]
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fxs: [0.01964988 0.02087246 0.02110695 0.02127093 0.02202886 0.02284354
 0.0238388 ]
Centroid: [0.34884429 0.52913864 0.36718933]
x_new: [[0.35218385 0.54501007 0.38842524]]
fx_new [0.01819079]
Expanding
————————
xs: [[0.3555234  0.56088149 0.40966114]
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 [0.36431095 0.51874052 0.33199855]]
fxs: [0.01750884 0.01964988 0.02087246 0.02110695 0.02127093 0.02202886
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Centroid: [0.35027553 0.53594068 0.37629043]
x_new: [[0.3362401   0.55314085 0.42058232]]
fx_new [0.02050895]
Back to top
————————
xs: [[0.3555234   0.56088149 0.40966114]
 [0.344453    0.52800763 0.35065103]
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 [0.35220245 0.5249002   0.35379511]
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 [0.37009557 0.54777607 0.41421858]]
fxs: [0.01750884 0.01964988 0.02050895 0.02087246 0.02110695 0.02127093
 0.02202886]
Centroid: [0.34626541 0.54085501 0.38894526]
x_new: [[0.32243524 0.53393396 0.36367194]]
fx_new [0.01865717]
Back to top
————————
xs: [[0.3555234   0.56088149 0.40966114]
 [0.32243524 0.53393396 0.36367194]
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 [0.3362401   0.55314085 0.42058232]
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 [0.31397554 0.52471478 0.36064401]]
fxs: [0.01750884 0.01865717 0.01964988 0.02050895 0.02087246 0.02110695
 0.02127093]
Centroid: [0.33945679 0.53887757 0.38172431]
x_new: [[0.36493804 0.55304036 0.4028046 ]]
fx_new [0.01873605]
Back to top
————————
xs: [[0.3555234   0.56088149 0.40966114]
 [0.32243524 0.53393396 0.36367194]
 [0.36493804 0.55304036 0.4028046 ]
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 [0.3362401   0.55314085 0.42058232]
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fxs: [0.01750884 0.01865717 0.01873605 0.01964988 0.02050895 0.02087246
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Centroid: [0.34673715 0.54292408 0.38774725]
x_new: [[0.34210651 0.53928408 0.36242988]]
fx_new [0.0171499]
Expanding
————————
xs: [[0.34210651 0.53928408 0.36242988]
 [0.3555234   0.56088149 0.40966114]
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 [0.36493804 0.55304036 0.4028046 ]
 [0.344453    0.52800763 0.35065103]
 [0.3362401   0.55314085 0.42058232]
 [0.35220245 0.5249002   0.35379511]]
fxs: [0.0171499   0.01750884 0.01865717 0.01873605 0.01964988 0.02050895
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Centroid: [0.34541411 0.54188408 0.38051372]
x_new: [[0.33862576 0.55886796 0.40723232]]
fx_new [0.01710963]
Expanding
————————
xs: [[0.33862576 0.55886796 0.40723232]
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 [0.36493804 0.55304036 0.4028046 ]
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 [0.3362401   0.55314085 0.42058232]]
fxs: [0.01710963 0.0171499   0.01750884 0.01865717 0.01873605 0.01964988
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Centroid: [0.34347458 0.54673662 0.3881476 ]
x_new: [[0.35070906 0.54033239 0.35571289]]
fx_new [0.01676311]
Expanding
————————
xs: [[0.35070906 0.54033239 0.35571289]
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 [0.32243524 0.53393396 0.36367194]
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fxs: [0.01676311 0.01710963 0.0171499  0.01750884 0.01865717 0.01873605
 0.01964988]
Centroid: [0.34554157 0.54490684 0.37888054]
x_new: [[0.34663015 0.56180605 0.40711006]]
fx_new [0.01661556]
Expanding
————————
xs: [[0.34663015 0.56180605 0.40711006]
 [0.35070906 0.54033239 0.35571289]
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 [0.32243524 0.53393396 0.36367194]
 [0.36493804 0.55304036 0.4028046 ]]
fxs: [0.01661556 0.01676311 0.01710963 0.0171499  0.01750884 0.01865717
 0.01873605]
Centroid: [0.34585259 0.54973518 0.38694612]
x_new: [[0.32676715 0.54643001 0.37108763]]
fx_new [0.01592536]
Expanding
————————
xs: [[0.32676715 0.54643001 0.37108763]
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fxs: [0.01592536 0.01661556 0.01676311 0.01710963 0.0171499  0.01750884
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Centroid: [0.34039961 0.54879085 0.38241512]
x_new: [[0.35836398 0.56364773 0.40115831]]
fx_new [0.01583966]
Expanding
————————
xs: [[0.35836398 0.56364773 0.40115831]
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fxs: [0.01583966 0.01592536 0.01661556 0.01676311 0.01710963 0.0171499
 0.01750884]
Centroid: [0.34553229 0.55303567 0.38777032]
x_new: [[0.33554117 0.54518985 0.3658795 ]]
fx_new [0.01582074]
Expanding
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xs: [[0.33554117 0.54518985 0.3658795 ]
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0.0171499 ]
Centroid: [0.34267768 0.55079401 0.3815158 ]
x_new: [[0.34324885 0.56230394 0.40060172]]
fx_new [0.01551493]
Expanding
——————————
xs: [[0.34324885 0.56230394 0.40060172]
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fxs: [0.01551493 0.01582074 0.01583966 0.01592536 0.01661556
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Centroid: [0.34284087 0.55408256 0.38696892]
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fx_new [0.01507761]
Expanding
——————————
xs: [[0.34705598 0.54929716 0.36670552]
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fxs: [0.01507761 0.01551493 0.01582074 0.01583966 0.01592536 0.01661556
 0.01676311]
Centroid: [0.34404519 0.5527153  0.38117938]
x_new: [[0.33738132 0.56509822 0.40664586]]
fx_new [0.01570726]
Back to top
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xs: [[0.34705598 0.54929716 0.36670552]
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fx_new [0.01479669]
Expanding
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fxs: [0.01479669 0.01507761 0.01551493 0.01570726 0.01582074 0.01583966
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Centroid: [0.34085868 0.55466677 0.38312564]
x_new: [[0.35495021 0.56290354 0.39516365]]
fx_new [0.01505706]
Back to top
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Centroid: [0.34488483 0.55702014 0.38656508]
x_new: [[0.33140569 0.55039254 0.37197184]]
fx_new [0.01501632]
Back to top
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fxs: [0.01479669 0.01501632 0.01505706 0.01507761 0.01551493 0.01570726
 0.01582074]
Centroid: [0.34103365 0.55512654 0.38239558]
x_new: [[0.34652613 0.56506323 0.39891166]]
fx_new [0.01479783]
Back to top
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fxs: [0.01479669 0.01479783 0.01501632 0.01505706 0.01507761 0.01551493
 0.01570726]
Centroid: [0.34260293 0.55796559 0.38711446]
x_new: [[0.34782454 0.55083296 0.36758306]]
fx_new [0.01480049]
Back to top
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xs: [[0.33765231 0.55070051 0.36980097]
 [0.34652613 0.56506323 0.39891166]
 [0.34782454 0.55083296 0.36758306]
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 [0.34324885 0.56230394 0.40060172]]
fxs: [0.01479669 0.01479783 0.01480049 0.01501632 0.01505706 0.01507761
 0.01551493]
Centroid: [0.34409482 0.5559277  0.38153406]
x_new: [[0.34494078 0.54955146 0.3624664 ]]
fx_new [0.01469944]
Expanding
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 [0.34705598 0.54929716 0.36670552]]
fxs: [0.01469944 0.01479669 0.01479783 0.01480049 0.01501632 0.01505706
 0.01507761]
Centroid: [0.34433652 0.55410592 0.37608616]
x_new: [[0.34161706 0.55891467 0.3854668 ]]
fx_new [0.01439701]
Expanding
————————
xs: [[0.34161706 0.55891467 0.3854668 ]
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fxs: [0.01439701 0.01469944 0.01479669 0.01479783 0.01480049 0.01501632
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0.01505706]
Centroid: [0.34355953 0.55547985 0.37876634]
x_new: [[0.33216885 0.54805615 0.36236903]]
fx_new [0.01491288]
Back to top
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Centroid: [0.34030505 0.55335879 0.37408139]
x_new: [[0.34920441 0.55632503 0.37619095]]
fx_new [0.01426394]
Expanding
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Centroid: [0.34411906 0.55463004 0.37498549]
x_new: [[0.35606928 0.56120393 0.38760195]]
fx_new [0.0145844]
Back to top
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Centroid: [0.34753341 0.55650829 0.37859019]
x_new: [[0.34724228 0.56218362 0.38959732]]
fx_new [0.0142758]
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Centroid: [0.34745023 0.55812981 0.38173508]
x_new: [[0.34837433 0.5511964  0.36455851]]
fx_new [0.01453463]
Back to top
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fx_new [0.01418939]
Back to top
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Centroid: [0.3505891  0.5577055  0.37883507]
x_new: [[0.35623742 0.56585955 0.39520374]]
fx_new [0.01451462]
Back to top
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 0.0145844 ]
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x_new: [[0.34833654 0.55886653 0.37942172]]
fx_new [0.0139701]
Expanding
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Centroid: [0.35054589 0.55953436 0.38175893]
x_new: [[0.35271745 0.56787232 0.39895934]]
fx_new [0.01444284]
Back to top
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fxs: [0.01376209 0.01416509 0.01418939 0.0142758  0.01439701 0.01444284
 0.01451462]
Centroid: [0.35116634 0.56191663 0.38667333]
x_new: [[0.34609525 0.55797372 0.37814292]]
fx_new [0.01398492]
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xs: [[0.34447017 0.55769783 0.3753316 ]
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fxs: [0.01376209 0.01398492 0.01416509 0.01418939 0.0142758  0.01439701
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Centroid: [0.34971745 0.56079009 0.38423607]
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fx_new [0.01424778]
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Centroid: [0.34886031 0.55876659 0.38002942]
x_new: [[0.35610357 0.55861851 0.37459205]]
fx_new [0.01389517]
Back to top
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fxs: [0.01376209 0.01389517 0.01398492 0.01416509 0.01418939 0.01424778
 0.0142758 ]
Centroid: [0.35092981 0.55872428 0.37847589]
x_new: [[0.35461735 0.55526495 0.36735445]]
fx_new [0.01402079]
Back to top
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xs: [[0.34447017 0.55769783 0.3753316 ]
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fxs: [0.01376209 0.01389517 0.01398492 0.01402079 0.01416509 0.01418939
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Centroid: [0.35198339 0.5577359  0.37529833]
x_new: [[0.35724933 0.56176395 0.38108387]]
fx_new [0.01385667]
Back to top
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Centroid: [0.35348795 0.55888677 0.37695134]
x_new: [[0.34919969 0.55617638 0.37004867]]
fx_new [0.01380786]
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fxs: [0.01376209 0.01380786 0.01385667 0.01389517 0.01398492 0.01402079
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Centroid: [0.35226273 0.55811237 0.37497915]
x_new: [[0.34642169 0.55693347 0.37165781]]
fx_new [0.01368145]
Expanding
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fxs: [0.01357924 0.01376209 0.01380786 0.01385667 0.01389517 0.01398492
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Centroid: [0.34975943 0.55760713 0.37355572]
x_new: [[0.34490151 0.55994931 0.37975698]]
fx_new [0.01367757]
Back to top
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fxs: [0.01357924 0.01367757 0.01376209 0.01380786 0.01385667 0.01389517
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Centroid: [0.34837145 0.55827632 0.37532751]
x_new: [[0.35064766 0.55857893 0.37251209]]
fx_new [0.01351772]
Expanding
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xs: [[0.35292386 0.55888153 0.36969668]
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fxs: [0.01332372 0.01357924 0.01367757 0.01376209 0.01380786 0.01385667
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Centroid: [0.34934697 0.55840601 0.3741209 ]
x_new: [[0.34259037 0.55819351 0.37364975]]
fx_new [0.01347753]
Back to top
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Centroid: [0.34741651 0.5583453  0.37398629]
x_new: [[0.33758369 0.55492665 0.36688871]]
fx_new [0.01362986]
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Centroid: [0.34460714 0.55736854 0.37195841]
x_new: [[0.34001458 0.5585607  0.37386815]]
fx_new [0.01337461]
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fxs: [0.01332372 0.01337461 0.01347753 0.01357924 0.01362986 0.01367757
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Centroid: [0.34329498 0.55770916 0.37250405]
x_new: [[0.34211979 0.55772048 0.36967649]]
fx_new [0.0132673]
Expanding
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fxs: [0.01304803 0.01332372 0.01337461 0.01347753 0.01357924 0.01362986
 0.01367757]
Centroid: [0.34279132 0.55771401 0.37129224]
x_new: [[0.34068114 0.55547871 0.36282749]]
fx_new [0.01328666]
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Centroid: [0.34218841 0.55707535 0.36887374]
x_new: [[0.34679313 0.55922406 0.37085877]]
fx_new [0.01313324]
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Centroid: [0.34350405 0.55768927 0.36944089]
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Expanding
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fx_new [0.01288938]
Back to top
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fxs: [0.0127724  0.01288938 0.01304803 0.01313324 0.01328666 0.01332372
 0.01337461]
Centroid: [0.34537595 0.55861126 0.36884692]
x_new: [[0.35073731 0.55866182 0.3638257 ]]
fx_new [0.01289773]
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fxs: [0.0127724  0.01288938 0.01289773 0.01304803 0.01313324 0.01328666
 0.01332372]
Centroid: [0.34690777 0.55862571 0.36741229]
x_new: [[0.34089167 0.55836988 0.3651279 ]]
fx_new [0.01279622]
Back to top
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fxs: [0.0127724  0.01279622 0.01288938 0.01289773 0.01304803 0.01313324
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Centroid: [0.34518888 0.55855262 0.36675961]
x_new: [[0.34969663 0.56162652 0.37069172]]
fx_new [0.01269684]
Expanding
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xs: [[0.35420437 0.56470043 0.37462383]
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fxs: [0.01253762 0.0127724  0.01279622 0.01288938 0.01289773 0.01304803
 0.01313324]
Centroid: [0.34712077 0.55987    0.3684448 ]
x_new: [[0.34744841 0.56051595 0.36603082]]
fx_new [0.01253634]
Expanding
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fxs: [0.01225694 0.01253762 0.0127724  0.01279622 0.01288938 0.01289773
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Centroid: [0.34726119 0.56014684 0.36741024]
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fx_new [0.01244745]
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fxs: [0.01225694 0.01244745 0.01253762 0.0127724  0.01279622 0.01288938
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Centroid: [0.34906593 0.56083685 0.36757061]
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fx_new [0.01238468]
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 0.01288938]
Centroid: [0.34858839 0.56145828 0.36864058]
x_new: [[0.3502533  0.56407321 0.37110248]]
fx_new [0.01223821]
Expanding
——————————
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 [0.34777605 0.56116189 0.36361685]
 [0.34739455 0.56301187 0.37131551]
 [0.35357778 0.56256187 0.36797154]
 [0.35420437 0.56470043 0.37462383]
 [0.34935083 0.56155868 0.37164975]
 [0.34089167 0.55836988 0.3651279 ]]
fxs: [0.01195964 0.01225694 0.01238468 0.01244745 0.01253762 0.0127724
 0.01279622]
Centroid: [0.34930192 0.56257897 0.36969568]
x_new: [[0.35771217 0.56678805 0.37426346]]
fx_new [0.01224534]
Back to top
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xs: [[0.3519182  0.56668815 0.37356438]
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 [0.34777605 0.56116189 0.36361685]
 [0.34739455 0.56301187 0.37131551]
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fxs: [0.01195964 0.01224534 0.01225694 0.01238468 0.01244745 0.01253762
 0.0127724 ]
Centroid: [0.35170485 0.56378156 0.37100076]
x_new: [[0.35405887 0.56600444 0.37035177]]
fx_new [0.0119328]
Expanding
——————————
xs: [[0.35641289 0.56822732 0.36970277]
 [0.3519182  0.56668815 0.37356438]
 [0.35771217 0.56678805 0.37426346]
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 [0.34739455 0.56301187 0.37131551]
 [0.35357778 0.56256187 0.36797154]
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fxs: [0.01154571 0.01195964 0.01224534 0.01225694 0.01238468 0.01244745
```

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Centroid: [0.35271372 0.56473422 0.37072262]
x_new: [[0.35122306 0.56476802 0.36682141]]
fx_new [0.01182483]
Back to top
——————————
xs: [[0.35641289 0.56822732 0.36970277]
 [0.35122306 0.56476802 0.36682141]
 [0.3519182  0.56668815 0.37356438]
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fxs: [0.01154571 0.01182483 0.01195964 0.01224534 0.01225694 0.01238468
 0.01244745]
Centroid: [0.35228782 0.56474388 0.36960799]
x_new: [[0.35099785 0.5669259  0.37124444]]
fx_new [0.01169751]
Back to top
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xs: [[0.35641289 0.56822732 0.36970277]
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 [0.35122306 0.56476802 0.36682141]
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fxs: [0.01154571 0.01169751 0.01182483 0.01195964 0.01224534 0.01225694
 0.01238468]
Centroid: [0.35191925 0.56536731 0.37007555]
x_new: [[0.35644396 0.56772276 0.36883558]]
fx_new [0.01158441]
Back to top
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xs: [[0.35641289 0.56822732 0.36970277]
 [0.35644396 0.56772276 0.36883558]
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 [0.3519182  0.56668815 0.37356438]
 [0.35771217 0.56678805 0.37426346]
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fxs: [0.01154571 0.01158441 0.01169751 0.01182483 0.01195964 0.01224534
 0.01225694]
Centroid: [0.35321203 0.5660403  0.36972127]
x_new: [[0.358648   0.57091871 0.37582569]]
fx_new [0.0116141]
Back to top
——————————
xs: [[0.35641289 0.56822732 0.36970277]
 [0.35644396 0.56772276 0.36883558]
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 [0.35771217 0.56678805 0.37426346]]
fxs: [0.01154571 0.01158441 0.0116141  0.01169751 0.01182483 0.01195964
 0.01224534]
Centroid: [0.35476516 0.56743413 0.37146539]
x_new: [[0.35181815 0.56808021 0.36866732]]
fx_new [0.01130947]
Expanding
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xs: [[0.34887114 0.56872629 0.36586925]
 [0.35641289 0.56822732 0.36970277]
 [0.35644396 0.56772276 0.36883558]
 [0.358648   0.57091871 0.37582569]
 [0.35099785 0.5669259  0.37124444]
 [0.35122306 0.56476802 0.36682141]
 [0.3519182  0.56668815 0.37356438]]
fxs: [0.01089233 0.01154571 0.01158441 0.0116141  0.01169751 0.01182483
```

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2223    0.01195964]
2224 Centroid: [0.35350216 0.56771102 0.37026622]
2225 x_new: [[0.35508612 0.56873389 0.36696806]]
2226 fx_new [0.01119531]
2227 Back to top
2228 ————————
2229 xs: [[0.34887114 0.56872629 0.36586925]
2230  [0.35508612 0.56873389 0.36696806]
2231  [0.35641289 0.56822732 0.36970277]
2232  [0.35644396 0.56772276 0.36883558]
2233  [0.358648   0.57091871 0.37582569]
2234  [0.35099785 0.5669259  0.37124444]
2235  [0.35122306 0.56476802 0.36682141]]
2236 fxs: [0.01089233 0.01119531 0.01154571 0.01158441 0.0116141  0.01169751
2237  0.01182483]
2238 Centroid: [0.35395472 0.56800327 0.36932388]
2239 x_new: [[0.35668637 0.57123852 0.37182636]]
2240 fx_new [0.01113361]
2241 Back to top
2242 ————————
2243 xs: [[0.34887114 0.56872629 0.36586925]
2244  [0.35668637 0.57123852 0.37182636]
2245  [0.35508612 0.56873389 0.36696806]
2246  [0.35641289 0.56822732 0.36970277]
2247  [0.35644396 0.56772276 0.36883558]
2248  [0.358648   0.57091871 0.37582569]
2249  [0.35099785 0.5669259  0.37124444]]
2250 fxs: [0.01089233 0.01113361 0.01119531 0.01154571 0.01158441 0.0116141
2251  0.01169751]
2252 Centroid: [0.35473519 0.56892763 0.37003888]
2253 x_new: [[0.35847253 0.57092936 0.36883331]]
2254 fx_new [0.01105786]
2255 Back to top
2256 ————————
2257 xs: [[0.34887114 0.56872629 0.36586925]
2258  [0.35847253 0.57092936 0.36883331]
2259  [0.35668637 0.57123852 0.37182636]
2260  [0.35508612 0.56873389 0.36696806]
2261  [0.35641289 0.56822732 0.36970277]
2262  [0.35644396 0.56772276 0.36883558]
2263  [0.358648   0.57091871 0.37582569]]
2264 fxs: [0.01089233 0.01105786 0.01113361 0.01119531 0.01154571 0.01158441
2265  0.0116141 ]
2266 Centroid: [0.355803   0.56949955 0.36969443]
2267 x_new: [[0.352958   0.56808039 0.36356317]]
2268 fx_new [0.01101822]
2269 Back to top
2270 ————————
2271 xs: [[0.34887114 0.56872629 0.36586925]
2272  [0.352958   0.56808039 0.36356317]
2273  [0.35847253 0.57092936 0.36883331]
2274  [0.35668637 0.57123852 0.37182636]
2275  [0.35508612 0.56873389 0.36696806]
2276  [0.35641289 0.56822732 0.36970277]
2277  [0.35644396 0.56772276 0.36883558]]
2278 fxs: [0.01089233 0.01101822 0.01105786 0.01113361 0.01119531 0.01154571
2279  0.01158441]
2280 Centroid: [0.35499015 0.56909408 0.36794264]
2281 x_new: [[0.35353633 0.57046539 0.36704971]]
2282 fx_new [0.01079964]
2283 Expanding
2284 ————————
2285 xs: [[0.35208252 0.57183671 0.36615677]
2286  [0.34887114 0.56872629 0.36586925]
2287  [0.352958   0.56808039 0.36356317]
2288  [0.35847253 0.57092936 0.36883331]
2289  [0.35668637 0.57123852 0.37182636]
2290  [0.35508612 0.56873389 0.36696806]
2291  [0.35641289 0.56822732 0.36970277]]
2292 fxs: [0.01042163 0.01089233 0.01101822 0.01105786 0.01113361 0.01119531
```

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2293   0.01154571]
2294  Centroid: [0.35436708 0.56968178 0.36755996]
2295  x_new: [[0.35232127 0.57113624 0.36541714]]
2296  fx_new [0.01051597]
2297  Back to top
2298  ————————————
2299  xs: [[0.35208252 0.57183671 0.36615677]
2300   [0.35232127 0.57113624 0.36541714]
2301   [0.34887114 0.56872629 0.36586925]
2302   [0.352958   0.56808039 0.36356317]
2303   [0.35847253 0.57092936 0.36883331]
2304   [0.35668637 0.57123852 0.37182636]
2305   [0.35508612 0.56873389 0.36696806]]
2306  fxs: [0.01042163 0.01051597 0.01089233 0.01101822 0.01105786 0.01113361
2307   0.01119531]
2308  Centroid: [0.35378257 0.57009734 0.36694772]
2309  x_new: [[0.35247902 0.57146079 0.36692739]]
2310  fx_new [0.01055928]
2311  Back to top
2312  ————————————
2313  xs: [[0.35208252 0.57183671 0.36615677]
2314   [0.35232127 0.57113624 0.36541714]
2315   [0.35247902 0.57146079 0.36692739]
2316   [0.34887114 0.56872629 0.36586925]
2317   [0.352958   0.56808039 0.36356317]
2318   [0.35847253 0.57092936 0.36883331]
2319   [0.35668637 0.57123852 0.37182636]]
2320  fxs: [0.01042163 0.01051597 0.01055928 0.01089233 0.01101822 0.01105786
2321   0.01113361]
2322  Centroid: [0.35341012 0.5704869  0.36694191]
2323  x_new: [[0.35013387 0.56973528 0.36205747]]
2324  fx_new [0.01050303]
2325  Back to top
2326  ————————————
2327  xs: [[0.35208252 0.57183671 0.36615677]
2328   [0.35013387 0.56973528 0.36205747]
2329   [0.35232127 0.57113624 0.36541714]
2330   [0.35247902 0.57146079 0.36692739]
2331   [0.34887114 0.56872629 0.36586925]
2332   [0.352958   0.56808039 0.36356317]
2333   [0.35847253 0.57092936 0.36883331]]
2334  fxs: [0.01042163 0.01050303 0.01051597 0.01055928 0.01089233 0.01101822
2335   0.01105786]
2336  Centroid: [0.35247405 0.57027215 0.36554636]
2337  x_new: [[0.34647557 0.56961495 0.3622594 ]]
2338  fx_new [0.01042847]
2339  Back to top
2340  ————————————
2341  xs: [[0.35208252 0.57183671 0.36615677]
2342   [0.34647557 0.56961495 0.3622594 ]
2343   [0.35013387 0.56973528 0.36205747]
2344   [0.35232127 0.57113624 0.36541714]
2345   [0.35247902 0.57146079 0.36692739]
2346   [0.34887114 0.56872629 0.36586925]
2347   [0.352958   0.56808039 0.36356317]]
2348  fxs: [0.01042163 0.01042847 0.01050303 0.01051597 0.01055928 0.01089233
2349   0.01101822]
2350  Centroid: [0.3507602  0.57008438 0.36460723]
2351  x_new: [[0.34856239 0.57208837 0.36565128]]
2352  fx_new [0.01022143]
2353  Expanding
2354  ————————————
2355  xs: [[0.34636459 0.57409235 0.36669534]
2356   [0.35208252 0.57183671 0.36615677]
2357   [0.34647557 0.56961495 0.3622594 ]
2358   [0.35013387 0.56973528 0.36205747]
2359   [0.35232127 0.57113624 0.36541714]
2360   [0.35247902 0.57146079 0.36692739]
2361   [0.34887114 0.56872629 0.36586925]]
2362  fxs: [0.00985284 0.01042163 0.01042847 0.01050303 0.01051597 0.01055928
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 0.01089233]
Centroid: [0.34981828 0.57094323 0.36505468]
x_new: [[0.35076542 0.57316017 0.36424011]]
fx_new [0.01000257]
Back to top
————————————
xs: [[0.34636459 0.57409235 0.36669534]
 [0.35076542 0.57316017 0.36424011]
 [0.35208252 0.57183671 0.36615677]
 [0.34647557 0.56961495 0.3622594 ]
 [0.35013387 0.56973528 0.36205747]
 [0.35232127 0.57113624 0.36541714]
 [0.35247902 0.57146079 0.36692739]]
fxs: [0.00985284 0.01000257 0.01042163 0.01042847 0.01050303 0.01051597
 0.01055928]
Centroid: [0.35008889 0.57157664 0.36482195]
x_new: [[0.34769877 0.57169249 0.3627165 ]]
fx_new [0.01008983]
Back to top
————————————
xs: [[0.34636459 0.57409235 0.36669534]
 [0.35076542 0.57316017 0.36424011]
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 [0.35208252 0.57183671 0.36615677]
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 [0.35013387 0.56973528 0.36205747]
 [0.35232127 0.57113624 0.36541714]]
fxs: [0.00985284 0.01000257 0.01008983 0.01042163 0.01042847 0.01050303
 0.01051597]
Centroid: [0.349406   0.57160974 0.36422039]
x_new: [[0.34649073 0.57208324 0.36302364]]
fx_new [0.01000066]
Back to top
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 [0.34769877 0.57169249 0.3627165 ]
 [0.35208252 0.57183671 0.36615677]
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 [0.35013387 0.56973528 0.36205747]]
fxs: [0.00985284 0.01000066 0.01000257 0.01008983 0.01042163 0.01042847
 0.01050303]
Centroid: [0.34857307 0.57174503 0.36387846]
x_new: [[0.34701226 0.57375477 0.36569946]]
fx_new [0.0098673]
Back to top
————————————
xs: [[0.34636459 0.57409235 0.36669534]
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fxs: [0.00985284 0.0098673   0.01000066 0.01000257 0.01008983 0.01042163
 0.01042847]
Centroid: [0.34812712 0.57231924 0.36439875]
x_new: [[0.34977868 0.57502354 0.36653809]]
fx_new [0.00977147]
Expanding
————————————
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 [0.34649073 0.57208324 0.36302364]
 [0.35076542 0.57316017 0.36424011]
 [0.34769877 0.57169249 0.3627165 ]
 [0.35208252 0.57183671 0.36615677]]
fxs: [0.00948682 0.00985284 0.0098673   0.01000066 0.01000257 0.01008983
```

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0.01042163]
Centroid: [0.34883493 0.57347822 0.36531561]
x_new: [[0.34558735 0.57511974 0.36447444]]
fx_new [0.00950077]
Back to top
————————
xs: [[0.35143023 0.57772783 0.36867743]
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 [0.34636459 0.57409235 0.36669534]
 [0.34701226 0.57375477 0.36569946]
 [0.34649073 0.57208324 0.36302364]
 [0.35076542 0.57316017 0.36424011]
 [0.34769877 0.57169249 0.3627165 ]]
fxs: [0.00948682 0.00950077 0.00985284 0.0098673  0.01000066 0.01000257
 0.01008983]
Centroid: [0.34790705 0.57394723 0.36507527]
x_new: [[0.34811533 0.57620197 0.36743405]]
fx_new [0.00956523]
Back to top
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xs: [[0.35143023 0.57772783 0.36867743]
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 [0.34811533 0.57620197 0.36743405]
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 [0.34701226 0.57375477 0.36569946]
 [0.34649073 0.57208324 0.36302364]
 [0.35076542 0.57316017 0.36424011]]
fxs: [0.00948682 0.00950077 0.00956523 0.00985284 0.0098673  0.01000066
 0.01000257]
Centroid: [0.34796656 0.57459144 0.36574921]
x_new: [[0.3451677  0.57602271 0.36725831]]
fx_new [0.00950728]
Back to top
————————
xs: [[0.35143023 0.57772783 0.36867743]
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 [0.3451677  0.57602271 0.36725831]
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fxs: [0.00948682 0.00950077 0.00950728 0.00956523 0.00985284 0.0098673
 0.01000066]
Centroid: [0.34716688 0.57500037 0.36618038]
x_new: [[0.34784304 0.5779175  0.36933712]]
fx_new [0.00938322]
Expanding
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xs: [[0.34851919 0.58083463 0.37249386]
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 [0.34558735 0.57511974 0.36447444]
 [0.3451677  0.57602271 0.36725831]
 [0.34811533 0.57620197 0.36743405]
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 [0.34701226 0.57375477 0.36569946]]
fxs: [0.0091313  0.00948682 0.00950077 0.00950728 0.00956523 0.00985284
 0.0098673 ]
Centroid: [0.34745666 0.57625057 0.36753327]
x_new: [[0.34790106 0.57874637 0.36936708]]
fx_new [0.00924063]
Back to top
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xs: [[0.34851919 0.58083463 0.37249386]
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 [0.34558735 0.57511974 0.36447444]
 [0.3451677  0.57602271 0.36725831]
 [0.34811533 0.57620197 0.36743405]
 [0.34636459 0.57409235 0.36669534]]
fxs: [0.0091313  0.00924063 0.00948682 0.00950077 0.00950728 0.00956523
```

```
 0.00985284]
Centroid: [0.34758363 0.57696366 0.36805722]
x_new: [[0.34880268 0.57983496 0.3694191 ]]
fx_new [0.00908123]
Expanding
————————
xs: [[0.35002173 0.58270626 0.37078098]
 [0.34851919 0.58083463 0.37249386]
 [0.34790106 0.57874637 0.36936708]
 [0.35143023 0.57772783 0.36867743]
 [0.34558735 0.57511974 0.36447444]
 [0.3451677  0.57602271 0.36725831]
 [0.34811533 0.57620197 0.36743405]]
fxs: [0.00873018 0.0091313  0.00924063 0.00948682 0.00950077 0.00950728
 0.00956523]
Centroid: [0.34810608 0.57819422 0.36864088]
x_new: [[0.34809684 0.58018647 0.36984771]]
fx_new [0.00903009]
Back to top
————————
xs: [[0.35002173 0.58270626 0.37078098]
 [0.34809684 0.58018647 0.36984771]
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Centroid: [0.34810344 0.57876343 0.36898569]
x_new: [[0.35103919 0.58150415 0.37071307]]
fx_new [0.0089634]
Back to top
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fx_new [0.0088912]
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Centroid: [0.34990076 0.58081128 0.37090916]
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fx_new [0.00866198]
Expanding
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fxs: [0.00830004 0.00873018 0.0088912  0.0089634  0.00903009 0.0091313
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0.00924063]
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x_new: [[0.35058949 0.58551915 0.37436415]]
fx_new [0.00856622]
Back to top
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fxs: [0.00830004 0.00856622 0.00873018 0.0088912  0.0089634  0.00903009
 0.0091313 ]
Centroid: [0.34962934 0.5831003  0.37257949]
x_new: [[0.35073949 0.58536597 0.37266511]]
fx_new [0.00845977]
Back to top
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xs: [[0.34684183 0.58697818 0.37537262]
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Centroid: [0.34994652 0.58374763 0.37260395]
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fx_new [0.00840481]
Back to top
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fxs: [0.00830004 0.00840481 0.00845977 0.00856622 0.00873018 0.0088912
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Centroid: [0.35047501 0.58476511 0.37339145]
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fx_new [0.00828557]
Expanding
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 0.0088912 ]
Centroid: [0.35023321 0.58616266 0.37453932]
x_new: [[0.34816932 0.58835208 0.37459464]]
fx_new [0.00805578]
Back to top
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fxs: [0.00800103 0.00805578 0.00830004 0.00840481 0.00845977 0.00856622
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Centroid: [0.34964353 0.58678821 0.37455513]
x_new: [[0.34926533 0.59087015 0.37832928]]
fx_new [0.00802358]
Back to top
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 [0.35179621 0.5873088  0.37536019]
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fxs: [0.00800103 0.00802358 0.00805578 0.00830004 0.00840481 0.00845977
 0.00856622]
Centroid: [0.34953547 0.58795448 0.37563346]
x_new: [[0.34848145 0.59038981 0.37690276]]
fx_new [0.00794592]
Expanding
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xs: [[0.34742744 0.59282514 0.37817206]
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fxs: [0.00766173 0.00800103 0.00802358 0.00805578 0.00830004 0.00840481
 0.00845977]
Centroid: [0.34908375 0.58899819 0.37617744]
x_new: [[0.34742801 0.59263042 0.37968978]]
fx_new [0.00782895]
Back to top
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fxs: [0.00766173 0.00782895 0.00800103 0.00802358 0.00805578 0.00830004
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Centroid: [0.34861068 0.59003597 0.37718097]
x_new: [[0.34542516 0.59276314 0.37900174]]
fx_new [0.00769355]
Back to top
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Centroid: [0.34770053 0.59081516 0.37770119]
x_new: [[0.34855924 0.59465214 0.38002976]]
fx_new [0.00759848]
Expanding
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fxs: [0.00731034 0.00766173 0.00769355 0.00782895 0.00800103 0.00802358
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Centroid: [0.34806855 0.59245958 0.37869915]
x_new: [[0.34796778 0.59656708 0.38280365]]
fx_new [0.00757543]
Back to top
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Centroid: [0.34803976 0.59363315 0.37987186]
x_new: [[0.34681418 0.59639615 0.38141445]]
fx_new [0.00743147]
Back to top
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Centroid: [0.34768959 0.59442258 0.3803126 ]
x_new: [[0.34603254 0.59755814 0.381877  ]]
fx_new [0.00729375]
Expanding
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fxs: [0.00698518 0.00731034 0.00743147 0.00757543 0.00766173 0.00769355
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Centroid: [0.34697943 0.59576639 0.38098306]
x_new: [[0.34653084 0.59890237 0.38227634]]
fx_new [0.00716159]
Back to top
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fxs: [0.00698518 0.00716159 0.00731034 0.00743147 0.00757543 0.00766173
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Centroid: [0.34685126 0.59666238 0.38135257]
x_new: [[0.34827737 0.60056163 0.38370339]]
fx_new [0.00713034]
Back to top
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fxs: [0.00698518 0.00713034 0.00716159 0.00731034 0.00743147 0.00757543
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Centroid: [0.34725872 0.59777645 0.38202423]
x_new: [[0.34709     0.60272777 0.3858764 ]]
fx_new [0.0070382]
Back to top
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fxs: [0.00698518 0.0070382  0.00713034 0.00716159 0.00731034 0.00743147
 0.00757543]
Centroid: [0.34721051 0.59919112 0.38312485]
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fx_new [0.00688914]
Expanding
————————————
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fxs: [0.00656867 0.00698518 0.0070382  0.00713034 0.00716159 0.00731034
 0.00743147]
Centroid: [0.34688597 0.6003157  0.38326251]
x_new: [[0.34695777 0.60423525 0.38511056]]
fx_new [0.00676419]
Back to top
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fxs: [0.00656867 0.00676419 0.00698518 0.0070382  0.00713034 0.00716159
 0.00731034]
Centroid: [0.34690649 0.60143557 0.38379052]
x_new: [[0.34439503 0.60438203 0.38522272]]
fx_new [0.00669425]
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Centroid: [0.34618893 0.60227742 0.38419972]
x_new: [[0.34584701 0.60565247 0.3861231 ]]
fx_new [0.00666608]
Back to top
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fxs: [0.00656867 0.00666608 0.00669425 0.00676419 0.00698518 0.0070382
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x_new: [[0.34390511 0.60592181 0.38579513]]
fx_new [0.00655394]
Expanding
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fxs: [0.00630491 0.00656867 0.00666608 0.00669425 0.00676419 0.00698518
 0.0070382 ]
Centroid: [0.34515433 0.60439033 0.38519749]
x_new: [[0.34321865 0.60605289 0.38451858]]
fx_new [0.00639168]
Back to top
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xs: [[0.34171898 0.6086019  0.386841  ]
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Centroid: [0.34460128 0.60486535 0.38500352]
x_new: [[0.34482706 0.60903699 0.38656563]]
fx_new [0.00628696]
Expanding
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fxs: [0.00599754 0.00630491 0.00639168 0.00656867 0.00666608 0.00669425
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Centroid: [0.34469804 0.6066532  0.38567299]
x_new: [[0.34243831 0.60907114 0.38623543]]
fx_new [0.00619878]
Back to top
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fxs: [0.00599754 0.00619878 0.00630491 0.00639168 0.00656867 0.00666608
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Centroid: [0.3440524  0.60734404 0.38583369]
x_new: [[0.34370977 0.61030604 0.38644466]]
fx_new [0.006105]
Back to top
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fxs: [0.00599754 0.006105    0.00619878 0.00630491 0.00639168 0.00656867
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     0.00666608]
Centroid : [0.34395451 0.60819032 0.38600825]
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fx_new [0.00596786]
Expanding
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fxs : [0.00564886 0.00599754 0.006105    0.00619878 0.00630491 0.00639168
 0.00656867]
Centroid : [0.34314344 0.60927797 0.38595903]
x_new : [[0.34059088 0.61411677 0.38815082]]
fx_new [0.00581912]
Back to top
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fxs : [0.00564886 0.00581912 0.00599754 0.006105    0.00619878 0.00630491
 0.00639168]
Centroid : [0.34241413 0.61066049 0.38658525]
x_new : [[0.34160962 0.61526809 0.38865193]]
fx_new [0.00577046]
Back to top
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 [0.34171898 0.6086019   0.386841   ]]
fxs : [0.00564886 0.00577046 0.00581912 0.00599754 0.006105    0.00619878
 0.00630491]
Centroid : [0.34218427 0.61197694 0.38717573]
x_new : [[0.34264956 0.61535199 0.38751046]]
fx_new [0.00565515]
Back to top
————————
xs : [[0.3401695   0.61326603 0.38577855]
 [0.34264956 0.61535199 0.38751046]
 [0.34160962 0.61526809 0.38865193]
 [0.34059088 0.61411677 0.38815082]
 [0.34505284 0.61320864 0.38812775]
 [0.34370977 0.61030604 0.38644466]
 [0.34243831 0.60907114 0.38623543]]
fxs : [0.00564886 0.00565515 0.00577046 0.00581912 0.00599754 0.006105
 0.00619878]
Centroid : [0.34231721 0.61294124 0.38727137]
x_new : [[0.34219611 0.61681134 0.38830731]]
fx_new [0.00558624]
Expanding
————————
xs : [[0.34207501 0.62068145 0.38934326]
 [0.3401695   0.61326603 0.38577855]
 [0.34264956 0.61535199 0.38751046]
 [0.34160962 0.61526809 0.38865193]
 [0.34059088 0.61411677 0.38815082]
 [0.34505284 0.61320864 0.38812775]
 [0.34370977 0.61030604 0.38644466]]
fxs : [0.00532817 0.00564886 0.00565515 0.00577046 0.00581912 0.00599754
```

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2993   0.006105   ]
2994  Centroid: [0.34226531 0.61459986 0.38771535]
2995  x_new: [[0.34082085 0.61889367 0.38898603]]
2996  fx_new [0.00543554]
2997  Back to top
2998  ————————
2999  xs: [[0.34207501 0.62068145 0.38934326]
3000   [0.34082085 0.61889367 0.38898603]
3001   [0.3401695  0.61326603 0.38577855]
3002   [0.34264956 0.61535199 0.38751046]
3003   [0.34160962 0.61526809 0.38865193]
3004   [0.34059088 0.61411677 0.38815082]
3005   [0.34505284 0.61320864 0.38812775]]
3006  fxs: [0.00532817 0.00543554 0.00564886 0.00565515 0.00577046 0.00581912
3007   0.00599754]
3008  Centroid: [0.34185261 0.61582666 0.3880784 ]
3009  x_new: [[0.33865238 0.61844468 0.38802905]]
3010  fx_new [0.00534527]
3011  Back to top
3012  ————————
3013  xs: [[0.34207501 0.62068145 0.38934326]
3014   [0.33865238 0.61844468 0.38802905]
3015   [0.34082085 0.61889367 0.38898603]
3016   [0.3401695  0.61326603 0.38577855]
3017   [0.34264956 0.61535199 0.38751046]
3018   [0.34160962 0.61526809 0.38865193]
3019   [0.34059088 0.61411677 0.38815082]]
3020  fxs: [0.00532817 0.00534527 0.00543554 0.00564886 0.00565515 0.00577046
3021   0.00581912]
3022  Centroid: [0.34093826 0.61657467 0.3880643 ]
3023  x_new: [[0.34128564 0.61903257 0.38797778]]
3024  fx_new [0.00531826]
3025  Expanding
3026  ————————
3027  xs: [[0.34163301 0.62149047 0.38789126]
3028   [0.34207501 0.62068145 0.38934326]
3029   [0.33865238 0.61844468 0.38802905]
3030   [0.34082085 0.61889367 0.38898603]
3031   [0.3401695  0.61326603 0.38577855]
3032   [0.34264956 0.61535199 0.38751046]
3033   [0.34160962 0.61526809 0.38865193]]
3034  fxs: [0.00508634 0.00532817 0.00534527 0.00543554 0.00564886 0.00565515
3035   0.00577046]
3036  Centroid: [0.34108713 0.61762805 0.38802722]
3037  x_new: [[0.34056465 0.61998802 0.38740251]]
3038  fx_new [0.00515466]
3039  Back to top
3040  ————————
3041  xs: [[0.34163301 0.62149047 0.38789126]
3042   [0.34056465 0.61998802 0.38740251]
3043   [0.34207501 0.62068145 0.38934326]
3044   [0.33865238 0.61844468 0.38802905]
3045   [0.34082085 0.61889367 0.38898603]
3046   [0.3401695  0.61326603 0.38577855]
3047   [0.34264956 0.61535199 0.38751046]]
3048  fxs: [0.00508634 0.00515466 0.00532817 0.00534527 0.00543554 0.00564886
3049   0.00565515]
3050  Centroid: [0.34093785 0.61830233 0.38784873]
3051  x_new: [[0.33922614 0.62125267 0.388187  ]]
3052  fx_new [0.00510608]
3053  Back to top
3054  ————————
3055  xs: [[0.34163301 0.62149047 0.38789126]
3056   [0.33922614 0.62125267 0.388187  ]
3057   [0.34056465 0.61998802 0.38740251]
3058   [0.34207501 0.62068145 0.38934326]
3059   [0.33865238 0.61844468 0.38802905]
3060   [0.34082085 0.61889367 0.38898603]
3061   [0.3401695  0.61326603 0.38577855]]
3062  fxs: [0.00508634 0.00510608 0.00515466 0.00532817 0.00534527 0.00543554
```

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 0.00564886]
Centroid: [0.34044879 0.61914528 0.38794538]
x_new: [[0.34072809 0.62502454 0.39011221]]
fx_new [0.00501259]
Expanding
————————
xs: [[0.34100738 0.63090379 0.39227905]
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 [0.33922614 0.62125267 0.388187  ]
 [0.34056465 0.61998802 0.38740251]
 [0.34207501 0.62068145 0.38934326]
 [0.33865238 0.61844468 0.38802905]
 [0.34082085 0.61889367 0.38898603]]
fxs: [0.00481247 0.00508634 0.00510608 0.00515466 0.00532817 0.00534527
 0.00543554]
Centroid: [0.34056849 0.62166496 0.38887402]
x_new: [[0.34031613 0.62443626 0.38876201]]
fx_new [0.00490451]
Back to top
————————
xs: [[0.34100738 0.63090379 0.39227905]
 [0.34031613 0.62443626 0.38876201]
 [0.34163301 0.62149047 0.38789126]
 [0.33922614 0.62125267 0.388187  ]
 [0.34056465 0.61998802 0.38740251]
 [0.34207501 0.62068145 0.38934326]
 [0.33865238 0.61844468 0.38802905]]
fxs: [0.00481247 0.00490451 0.00508634 0.00510608 0.00515466 0.00532817
 0.00534527]
Centroid: [0.34049639 0.62245676 0.38884202]
x_new: [[0.34234039 0.62646884 0.38965499]]
fx_new [0.00486912]
Back to top
————————
xs: [[0.34100738 0.63090379 0.39227905]
 [0.34234039 0.62646884 0.38965499]
 [0.34031613 0.62443626 0.38876201]
 [0.34163301 0.62149047 0.38789126]
 [0.33922614 0.62125267 0.388187  ]
 [0.34056465 0.61998802 0.38740251]
 [0.34207501 0.62068145 0.38934326]]
fxs: [0.00481247 0.00486912 0.00490451 0.00508634 0.00510608 0.00515466
 0.00532817]
Centroid: [0.34102325 0.62360307 0.3890743 ]
x_new: [[0.33997148 0.62652469 0.38880534]]
fx_new [0.00473259]
Expanding
————————
xs: [[0.33891971 0.62944632 0.38853638]
 [0.34100738 0.63090379 0.39227905]
 [0.34234039 0.62646884 0.38965499]
 [0.34031613 0.62443626 0.38876201]
 [0.34163301 0.62149047 0.38789126]
 [0.33922614 0.62125267 0.388187  ]
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fxs: [0.00446394 0.00481247 0.00486912 0.00490451 0.00508634 0.00510608
 0.00515466]
Centroid: [0.34057249 0.62485519 0.38895903]
x_new: [[0.34058033 0.62972237 0.39051555]]
fx_new [0.00468721]
Back to top
————————
xs: [[0.33891971 0.62944632 0.38853638]
 [0.34058033 0.62972237 0.39051555]
 [0.34100738 0.63090379 0.39227905]
 [0.34234039 0.62646884 0.38965499]
 [0.34031613 0.62443626 0.38876201]
 [0.34163301 0.62149047 0.38789126]
 [0.33922614 0.62125267 0.388187  ]]
fxs: [0.00446394 0.00468721 0.00481247 0.00486912 0.00490451 0.00508634
```

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 0.00510608]
Centroid: [0.34057473 0.62624582 0.38940375]
x_new: [[0.34192331 0.63123896 0.3906205 ]]
fx_new [0.00461073]
Back to top
——————————
xs: [[0.33891971 0.62944632 0.38853638]
 [0.34192331 0.63123896 0.3906205 ]
 [0.34058033 0.62972237 0.39051555]
 [0.34100738 0.63090379 0.39227905]
 [0.34234039 0.62646884 0.38965499]
 [0.34031613 0.62443626 0.38876201]
 [0.34163301 0.62149047 0.38789126]]
fxs: [0.00446394 0.00461073 0.00468721 0.00481247 0.00486912 0.00490451
 0.00508634]
Centroid: [0.34096004 0.62767243 0.38975139]
x_new: [[0.34028706 0.63385439 0.39161152]]
fx_new [0.00452135]
Back to top
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xs: [[0.33891971 0.62944632 0.38853638]
 [0.34028706 0.63385439 0.39161152]
 [0.34192331 0.63123896 0.3906205 ]
 [0.34058033 0.62972237 0.39051555]
 [0.34100738 0.63090379 0.39227905]
 [0.34234039 0.62646884 0.38965499]
 [0.34031613 0.62443626 0.38876201]]
fxs: [0.00446394 0.00452135 0.00461073 0.00468721 0.00481247 0.00486912
 0.00490451]
Centroid: [0.34076776 0.62943871 0.39028286]
x_new: [[0.34121939 0.63444115 0.3918037 ]]
fx_new [0.00451946]
Back to top
——————————
xs: [[0.33891971 0.62944632 0.38853638]
 [0.34121939 0.63444115 0.3918037 ]
 [0.34028706 0.63385439 0.39161152]
 [0.34192331 0.63123896 0.3906205 ]
 [0.34058033 0.62972237 0.39051555]
 [0.34100738 0.63090379 0.39227905]
 [0.34234039 0.62646884 0.38965499]]
fxs: [0.00446394 0.00451946 0.00452135 0.00461073 0.00468721 0.00481247
 0.00486912]
Centroid: [0.3408968  0.63086798 0.39071738]
x_new: [[0.3394532  0.63526711 0.39177978]]
fx_new [0.00443937]
Expanding
——————————
xs: [[0.3380096  0.63966624 0.39284217]
 [0.33891971 0.62944632 0.38853638]
 [0.34121939 0.63444115 0.3918037 ]
 [0.34028706 0.63385439 0.39161152]
 [0.34192331 0.63123896 0.3906205 ]
 [0.34058033 0.62972237 0.39051555]
 [0.34100738 0.63090379 0.39227905]]
fxs: [0.00429219 0.00446394 0.00451946 0.00452135 0.00461073 0.00468721
 0.00481247]
Centroid: [0.34027811 0.63275332 0.3911727 ]
x_new: [[0.33954884 0.63460285 0.39006634]]
fx_new [0.00428536]
Expanding
——————————
xs: [[0.33881958 0.63645237 0.38895999]
 [0.3380096  0.63966624 0.39284217]
 [0.33891971 0.62944632 0.38853638]
 [0.34121939 0.63444115 0.3918037 ]
 [0.34028706 0.63385439 0.39161152]
 [0.34192331 0.63123896 0.3906205 ]
 [0.34058033 0.62972237 0.39051555]]
fxs: [0.00403733 0.00429219 0.00446394 0.00451946 0.00452135 0.00461073
```

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0.00468721]
Centroid: [0.33996557 0.63354597 0.39069854]
x_new: [[0.33935081 0.63736958 0.39088154]]
fx_new [0.00420633]
Back to top
————————
xs: [[0.33881958 0.63645237 0.38895999]
 [0.33935081 0.63736958 0.39088154]
 [0.3380096  0.63966624 0.39284217]
 [0.33891971 0.62944632 0.38853638]
 [0.34121939 0.63444115 0.3918037 ]
 [0.34028706 0.63385439 0.39161152]
 [0.34192331 0.63123896 0.3906205 ]]
fxs: [0.00403733 0.00420633 0.00429219 0.00446394 0.00451946 0.00452135
 0.00461073]
Centroid: [0.33978992 0.63463843 0.39075083]
x_new: [[0.33765653 0.6380379  0.39088116]]
fx_new [0.00415005]
Back to top
————————
xs: [[0.33881958 0.63645237 0.38895999]
 [0.33765653 0.6380379  0.39088116]
 [0.33935081 0.63736958 0.39088154]
 [0.3380096  0.63966624 0.39284217]
 [0.33891971 0.62944632 0.38853638]
 [0.34121939 0.63444115 0.3918037 ]
 [0.34028706 0.63385439 0.39161152]]
fxs: [0.00403733 0.00415005 0.00420633 0.00429219 0.00446394 0.00451946
 0.00452135]
Centroid: [0.33918038 0.63560971 0.39078807]
x_new: [[0.33807371 0.63736502 0.38996461]]
fx_new [0.00408816]
Back to top
————————
xs: [[0.33881958 0.63645237 0.38895999]
 [0.33807371 0.63736502 0.38996461]
 [0.33765653 0.6380379  0.39088116]
 [0.33935081 0.63736958 0.39088154]
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 [0.33891971 0.62944632 0.38853638]
 [0.34121939 0.63444115 0.3918037 ]]
fxs: [0.00403733 0.00408816 0.00415005 0.00420633 0.00429219 0.00446394
 0.00451946]
Centroid: [0.33886419 0.63611123 0.39055279]
x_new: [[0.33650899 0.6377813  0.38930188]]
fx_new [0.00397693]
Expanding
————————
xs: [[0.33415379 0.63945137 0.38805097]
 [0.33881958 0.63645237 0.38895999]
 [0.33807371 0.63736502 0.38996461]
 [0.33765653 0.6380379  0.39088116]
 [0.33935081 0.63736958 0.39088154]
 [0.3380096  0.63966624 0.39284217]
 [0.33891971 0.62944632 0.38853638]]
fxs: [0.00373537 0.00403733 0.00408816 0.00415005 0.00420633 0.00429219
 0.00446394]
Centroid: [0.33785482 0.63682697 0.39001669]
x_new: [[0.33678993 0.64420763 0.391497  ]]
fx_new [0.00389937]
Back to top
————————
xs: [[0.33415379 0.63945137 0.38805097]
 [0.33678993 0.64420763 0.391497  ]
 [0.33881958 0.63645237 0.38895999]
 [0.33807371 0.63736502 0.38996461]
 [0.33765653 0.6380379  0.39088116]
 [0.33935081 0.63736958 0.39088154]
 [0.3380096  0.63966624 0.39284217]]
fxs: [0.00373537 0.00389937 0.00403733 0.00408816 0.00415005 0.00420633
```

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   0.00429219]
Centroid: [0.33755056 0.63893573 0.39043963]
x_new: [[0.33709153 0.63820522 0.3880371 ]]
fx_new [0.00381668]
Back to top
————————
xs: [[0.33415379 0.63945137 0.38805097]
 [0.33709153 0.63820522 0.3880371 ]
 [0.33678993 0.64420763 0.391497  ]
 [0.33881958 0.63645237 0.38895999]
 [0.33807371 0.63736502 0.38996461]
 [0.33765653 0.6380379  0.39088116]
 [0.33935081 0.63736958 0.39088154]]
fxs: [0.00373537 0.00381668 0.00389937 0.00403733 0.00408816 0.00415005
 0.00420633]
Centroid: [0.33741941 0.63872701 0.38975319]
x_new: [[0.33548801 0.64008445 0.38862485]]
fx_new [0.00376841]
Back to top
————————
xs: [[0.33415379 0.63945137 0.38805097]
 [0.33548801 0.64008445 0.38862485]
 [0.33709153 0.63820522 0.3880371 ]
 [0.33678993 0.64420763 0.391497  ]
 [0.33881958 0.63645237 0.38895999]
 [0.33807371 0.63736502 0.38996461]
 [0.33765653 0.6380379  0.39088116]]
fxs: [0.00373537 0.00376841 0.00381668 0.00389937 0.00403733 0.00408816
 0.00415005]
Centroid: [0.33686758 0.63911485 0.38943081]
x_new: [[0.33607863 0.6401918  0.38798046]]
fx_new [0.00369476]
Expanding
————————
xs: [[0.33528968 0.64126875 0.38653012]
 [0.33415379 0.63945137 0.38805097]
 [0.33548801 0.64008445 0.38862485]
 [0.33709153 0.63820522 0.3880371 ]
 [0.33678993 0.64420763 0.391497  ]
 [0.33881958 0.63645237 0.38895999]
 [0.33807371 0.63736502 0.38996461]]
fxs: [0.00347878 0.00373537 0.00376841 0.00381668 0.00389937 0.00403733
 0.00408816]
Centroid: [0.33652946 0.6395764  0.38880923]
x_new: [[0.33498521 0.64178778 0.38765386]]
fx_new [0.00357241]
Back to top
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xs: [[0.33528968 0.64126875 0.38653012]
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 [0.33709153 0.63820522 0.3880371 ]
 [0.33678993 0.64420763 0.391497  ]
 [0.33881958 0.63645237 0.38895999]]
fxs: [0.00347878 0.00357241 0.00373537 0.00376841 0.00381668 0.00389937
 0.00403733]
Centroid: [0.33608825 0.64020822 0.38847913]
x_new: [[0.33335691 0.64396408 0.38799826]]
fx_new [0.00350366]
Back to top
————————
xs: [[0.33528968 0.64126875 0.38653012]
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 [0.33498521 0.64178778 0.38765386]
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 [0.33709153 0.63820522 0.3880371 ]
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fxs: [0.00347878 0.00350366 0.00357241 0.00373537 0.00376841 0.00381668
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  0.00389937]
Centroid: [0.33530787 0.64128132 0.38834174]
x_new: [[0.3338258  0.63835502 0.38518648]]
fx_new [0.00349054]
Back to top
————————————
xs: [[0.33528968 0.64126875 0.38653012]
 [0.3338258  0.63835502 0.38518648]
 [0.33335691 0.64396408 0.38799826]
 [0.33498521 0.64178778 0.38765386]
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 [0.33709153 0.63820522 0.3880371 ]]
fxs: [0.00347878 0.00349054 0.00350366 0.00357241 0.00373537 0.00376841
 0.00381668]
Centroid: [0.33488442 0.64044524 0.38744023]
x_new: [[0.33267731 0.64268526 0.38684337]]
fx_new [0.00343886]
Expanding
————————————
xs: [[0.3304702  0.64492528 0.3862465 ]
 [0.33528968 0.64126875 0.38653012]
 [0.3338258  0.63835502 0.38518648]
 [0.33335691 0.64396408 0.38799826]
 [0.33498521 0.64178778 0.38765386]
 [0.33415379 0.63945137 0.38805097]
 [0.33548801 0.64008445 0.38862485]]
fxs: [0.00328069 0.00347878 0.00349054 0.00350366 0.00357241 0.00373537
 0.00376841]
Centroid: [0.33393852 0.64140525 0.38718443]
x_new: [[0.33238902 0.64272605 0.38574402]]
fx_new [0.00332092]
Back to top
————————————
xs: [[0.3304702  0.64492528 0.3862465 ]
 [0.33238902 0.64272605 0.38574402]
 [0.33528968 0.64126875 0.38653012]
 [0.3338258  0.63835502 0.38518648]
 [0.33335691 0.64396408 0.38799826]
 [0.33498521 0.64178778 0.38765386]
 [0.33415379 0.63945137 0.38805097]]
fxs: [0.00328069 0.00332092 0.00347878 0.00349054 0.00350366 0.00357241
 0.00373537]
Centroid: [0.3334958  0.64178262 0.38677289]
x_new: [[0.33283782 0.64411387 0.3854948 ]]
fx_new [0.00322969]
Expanding
————————————
xs: [[0.33217983 0.64644511 0.38421671]
 [0.3304702  0.64492528 0.3862465 ]
 [0.33238902 0.64272605 0.38574402]
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 [0.33498521 0.64178778 0.38765386]]
fxs: [0.00299936 0.00328069 0.00332092 0.00347878 0.00349054 0.00350366
 0.00357241]
Centroid: [0.33321381 0.64278172 0.38622513]
x_new: [[0.33144241 0.64377567 0.38479641]]
fx_new [0.00317602]
Back to top
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 [0.33144241 0.64377567 0.38479641]
 [0.3304702  0.64492528 0.3862465 ]
 [0.33238902 0.64272605 0.38574402]
 [0.33528968 0.64126875 0.38653012]
 [0.3338258  0.63835502 0.38518648]
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fxs: [0.00299936 0.00317602 0.00328069 0.00332092 0.00347878 0.00349054
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Centroid: [0.33270769 0.64306571 0.38581693]
x_new: [[0.33205847 0.64216734 0.38363559]]
fx_new [0.00313216]
Back to top
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fxs: [0.00299936 0.00313216 0.00317602 0.00328069 0.00332092 0.00347878
 0.00349054]
Centroid: [0.3325222  0.64280903 0.38519369]
x_new: [[0.3312186  0.64726304 0.3852009 ]]
fx_new [0.00307122]
Back to top
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 0.00347878]
Centroid: [0.33214975 0.64408161 0.38519575]
x_new: [[0.32900981 0.64689446 0.38386139]]
fx_new [0.00296272]
Expanding
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fxs: [0.00276334 0.00299936 0.00307122 0.00313216 0.00317602 0.00328069
 0.00332092]
Centroid: [0.33080406 0.64528711 0.38462388]
x_new: [[0.3292191  0.64784818 0.38350374]]
fx_new [0.00288813]
Back to top
——————————
xs: [[0.32586988 0.64970731 0.38252702]
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Centroid: [0.33035121 0.64601885 0.38430384]
x_new: [[0.33023222 0.64711242 0.38236118]]
fx_new [0.00279572]
Back to top
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xs: [[0.32586988 0.64970731 0.38252702]
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 [0.3292191  0.64784818 0.38350374]
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 [0.3312186  0.64726304 0.3852009 ]
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fxs: [0.00276334 0.00279572 0.00288813 0.00299936 0.00307122 0.00313216
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fx_new [0.00277045]
Back to top
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fxs: [0.00276334 0.00277045 0.00279572 0.00288813 0.00299936 0.00307122
 0.00313216]
Centroid: [0.32999573 0.64706148 0.38344948]
x_new: [[0.32793299 0.65195561 0.38326336]]
fx_new [0.00273859]
Expanding
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xs: [[0.32587025 0.65684975 0.38307724]
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fxs: [0.00262653 0.00276334 0.00277045 0.00279572 0.00288813 0.00299936
 0.00307122]
Centroid: [0.3291117  0.64915896 0.38336971]
x_new: [[0.3270048  0.65105488 0.38153852]]
fx_new [0.00260752]
Expanding
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xs: [[0.3248979  0.65295081 0.37970733]
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fxs: [0.00240983 0.00262653 0.00276334 0.00277045 0.00279572 0.00288813
 0.00299936]
Centroid: [0.32820874 0.6499715  0.38258492]
x_new: [[0.32423766 0.65349789 0.38095312]]
fx_new [0.00252379]
Back to top
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xs: [[0.3248979  0.65295081 0.37970733]
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fxs: [0.00240983 0.00252379 0.00262653 0.00276334 0.00277045 0.00279572
 0.00288813]
Centroid: [0.32707415 0.65097904 0.38211869]
x_new: [[0.3249292  0.6541099  0.38073363]]
fx_new [0.00247509]
Back to top
————————————
xs: [[0.3248979  0.65295081 0.37970733]
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fxs: [0.00240983 0.00247509 0.00252379 0.00262653 0.00276334 0.00277045
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Centroid: [0.32646131 0.65187357 0.38172296]
x_new: [[0.32269039 0.65663472 0.38108473]]
fx_new [0.00249411]
Back to top
————————
xs: [[0.3248979  0.65295081 0.37970733]
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 [0.32919203 0.64888693 0.38270118]]
fxs: [0.00240983 0.00247509 0.00249411 0.00252379 0.00262653 0.00276334
 0.00277045]
Centroid: [0.3253839  0.6532339  0.38154061]
x_new: [[0.32157578 0.65758088 0.38038004]]
fx_new [0.00243418]
Back to top
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fxs: [0.00240983 0.00243418 0.00247509 0.00249411 0.00252379 0.00262653
 0.00276334]
Centroid: [0.32429586 0.65447589 0.38120902]
x_new: [[0.32272185 0.65924447 0.37989101]]
fx_new [0.00233531]
Expanding
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xs: [[0.32114783 0.66401305 0.378573   ]
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fxs: [0.00220216 0.00240983 0.00243418 0.00247509 0.00249411 0.00252379
 0.00262653]
Centroid: [0.32362129 0.65651957 0.38064416]
x_new: [[0.32137232 0.65618939 0.37821107]]
fx_new [0.00226685]
Back to top
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fxs: [0.00220216 0.00226685 0.00240983 0.00243418 0.00247509 0.00249411
 0.00252379]
Centroid: [0.32297873 0.65642523 0.37994899]
x_new: [[0.32171979 0.65935258 0.37894486]]
fx_new [0.00226878]
Back to top
————————
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fxs: [0.00220216 0.00226685 0.00226878 0.00240983 0.00243418 0.00247509
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  0.00249411]
Centroid: [0.32261903 0.65726162 0.37966209]
x_new: [[0.32254767 0.65788851 0.37823946]]
fx_new [0.00220995]
Back to top
————————
xs: [[0.32114783 0.66401305 0.378573  ]
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 [0.3248979  0.65295081 0.37970733]
 [0.32157578 0.65758088 0.38038004]
 [0.3249292  0.6541099  0.38073363]]
fxs: [0.00220216 0.00220995 0.00226685 0.00226878 0.00240983 0.00243418
 0.00247509]
Centroid: [0.32259864 0.65744073 0.37925563]
x_new: [[0.32026809 0.66077156 0.37777762]]
fx_new [0.00218075]
Expanding
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xs: [[0.31793753 0.6641024  0.37629962]
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fxs: [0.00208971 0.00220216 0.00220995 0.00226685 0.00226878 0.00240983
 0.00243418]
Centroid: [0.32159983 0.65886823 0.3786222 ]
x_new: [[0.32162389 0.66015559 0.37686436]]
fx_new [0.00207446]
Expanding
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xs: [[0.32164795 0.66144294 0.37510652]
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fxs: [0.00190883 0.00208971 0.00220216 0.00220995 0.00226685 0.00226878
 0.00240983]
Centroid: [0.32161014 0.65941996 0.37786884]
x_new: [[0.31832238 0.6658891  0.37603034]]
fx_new [0.00204897]
Back to top
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fxs: [0.00190883 0.00204897 0.00208971 0.00220216 0.00220995 0.00226685
 0.00226878]
Centroid: [0.32067078 0.66126828 0.37734355]
x_new: [[0.31962177 0.66318399 0.37574225]]
fx_new [0.00199865]
Back to top
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fxs: [0.00190883 0.00199865 0.00204897 0.00208971 0.00220216 0.00220995
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Centroid: [0.32037107 0.66181563 0.37688604]
x_new: [[0.31936981 0.66744186 0.375561   ]]
fx_new [0.00197876]
Back to top
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fxs: [0.00190883 0.00197876 0.00199865 0.00204897 0.00208971 0.00220216
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Centroid: [0.32008499 0.66342312 0.37650745]
x_new: [[0.31762231 0.66895773 0.37477545]]
fx_new [0.00196953]
Back to top
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fxs: [0.00190883 0.00196953 0.00197876 0.00199865 0.00204897 0.00208971
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x_new: [[0.31761491 0.66599583 0.37345219]]
fx_new [0.00185704]
Expanding
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fxs: [0.00171646 0.00190883 0.00196953 0.00197876 0.00199865 0.00204897
 0.00208971]
Centroid: [0.31862431 0.66542932 0.37491528]
x_new: [[0.3193111  0.66675624 0.37353094]]
fx_new [0.00181248]
Back to top
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xs: [[0.31584844 0.66698721 0.37089178]
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fxs: [0.00171646 0.00181248 0.00190883 0.00196953 0.00197876 0.00199865
 0.00204897]
Centroid: [0.31882054 0.66580844 0.37451976]
x_new: [[0.31931869 0.66572778 0.37300917]]
fx_new [0.00177146]
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fxs: [0.00171646 0.00177146 0.00181248 0.00190883 0.00196953 0.00197876
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x_new: [[0.31830396 0.6683868  0.37243407]]
fx_new [0.00175771]
Back to top
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fxs: [0.00171646 0.00175771 0.00177146 0.00181248 0.00190883 0.00196953
 0.00197876]
Centroid: [0.31877461 0.66652865 0.37361556]
x_new: [[0.31817941 0.66561544 0.37167012]]
fx_new [0.00170046]
Expanding
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fxs: [0.00157622 0.00171646 0.00175771 0.00177146 0.00181248 0.00190883
 0.00196953]
Centroid: [0.31851952 0.66613728 0.3727818 ]
x_new: [[0.31941674 0.66331682 0.37078815]]
fx_new [0.00160776]
Back to top
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fxs: [0.00157622 0.00160776 0.00171646 0.00175771 0.00177146 0.00181248
 0.00190883]
Centroid: [0.31877587 0.66533143 0.37221219]
x_new: [[0.31590379 0.66921992 0.36931786]]
fx_new [0.00160519]
Back to top
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 0.00181248]
Centroid: [0.31795528 0.66644243 0.37138524]
x_new: [[0.31659945 0.66612862 0.36923953]]
fx_new [0.00156957]
Expanding
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 [0.31830396 0.6683868  0.37243407]
 [0.31931869 0.66572778 0.37300917]]
fxs: [0.00146773 0.00157622 0.00160519 0.00160776 0.00171646 0.00175771
```

```
  0.00177146]
Centroid: [0.31737421 0.66630794 0.37046565]
x_new: [[0.31542973 0.6668881  0.36792213]]
fx_new [0.00151697]
Back to top
————————————
xs: [[0.31524363 0.66581481 0.36709383]
 [0.31542973 0.6668881  0.36792213]
 [0.31758421 0.66470224 0.36972468]
 [0.31590379 0.66921992 0.36931786]
 [0.31941674 0.66331682 0.37078815]
 [0.31584844 0.66698721 0.37089178]
 [0.31830396 0.6683868  0.37243407]]
fxs: [0.00146773 0.00151697 0.00157622 0.00160519 0.00160776 0.00171646
 0.00175771]
Centroid: [0.31681864 0.6664737  0.36973893]
x_new: [[0.31533332 0.6645606  0.36704379]]
fx_new [0.00146483]
Expanding
————————————
xs: [[0.313848   0.6626475  0.36434865]
 [0.31524363 0.66581481 0.36709383]
 [0.31542973 0.6668881  0.36792213]
 [0.31758421 0.66470224 0.36972468]
 [0.31590379 0.66921992 0.36931786]
 [0.31941674 0.66331682 0.37078815]
 [0.31584844 0.66698721 0.37089178]]
fxs: [0.00135778 0.00146773 0.00151697 0.00157622 0.00160519 0.00160776
 0.00171646]
Centroid: [0.31618208 0.6656538  0.36858387]
x_new: [[0.31651571 0.66432039 0.36627595]]
fx_new [0.00137355]
Back to top
————————————
xs: [[0.313848   0.6626475  0.36434865]
 [0.31651571 0.66432039 0.36627595]
 [0.31524363 0.66581481 0.36709383]
 [0.31542973 0.6668881  0.36792213]
 [0.31758421 0.66470224 0.36972468]
 [0.31590379 0.66921992 0.36931786]
 [0.31941674 0.66331682 0.37078815]]
fxs: [0.00135778 0.00137355 0.00146773 0.00151697 0.00157622 0.00160519
 0.00160776]
Centroid: [0.3162774  0.66527283 0.36792446]
x_new: [[0.31313807 0.66722883 0.36506078]]
fx_new [0.0014148]
Back to top
————————————
xs: [[0.313848   0.6626475  0.36434865]
 [0.31651571 0.66432039 0.36627595]
 [0.31313807 0.66722883 0.36506078]
 [0.31524363 0.66581481 0.36709383]
 [0.31542973 0.6668881  0.36792213]
 [0.31758421 0.66470224 0.36972468]
 [0.31590379 0.66921992 0.36931786]]
fxs: [0.00135778 0.00137355 0.0014148  0.00146773 0.00151697 0.00157622
 0.00160519]
Centroid: [0.31538045 0.66583169 0.36710627]
x_new: [[0.31485711 0.66244345 0.36489468]]
fx_new [0.00135532]
Expanding
————————————
xs: [[0.31433376 0.65905521 0.36268308]
 [0.313848   0.6626475  0.36434865]
 [0.31651571 0.66432039 0.36627595]
 [0.31313807 0.66722883 0.36506078]
 [0.31524363 0.66581481 0.36709383]
 [0.31542973 0.6668881  0.36792213]
 [0.31758421 0.66470224 0.36972468]]
fxs: [0.00128033 0.00135778 0.00137355 0.0014148  0.00146773 0.00151697
```

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```
 0.00157622]
Centroid: [0.31515616 0.66437958 0.36615844]
x_new: [[0.31272811 0.66405693 0.3625922 ]]
fx_new [0.00128747]
Back to top
————————
xs: [[0.31433376 0.65905521 0.36268308]
 [0.31272811 0.66405693 0.3625922 ]
 [0.313848   0.6626475  0.36434865]
 [0.31651571 0.66432039 0.36627595]
 [0.31313807 0.66722883 0.36506078]
 [0.31524363 0.66581481 0.36709383]
 [0.31542973 0.6668881  0.36792213]]
fxs: [0.00128033 0.00128747 0.00135778 0.00137355 0.0014148  0.00146773
 0.00151697]
Centroid: [0.31446243 0.6642874  0.36513952]
x_new: [[0.31349514 0.66168669 0.3623569 ]]
fx_new [0.00126072]
Expanding
————————
xs: [[0.31252784 0.65908598 0.35957429]
 [0.31433376 0.65905521 0.36268308]
 [0.31272811 0.66405693 0.3625922 ]
 [0.313848   0.6626475  0.36434865]
 [0.31651571 0.66432039 0.36627595]
 [0.31313807 0.66722883 0.36506078]
 [0.31524363 0.66581481 0.36709383]]
fxs: [0.00117892 0.00128033 0.00128747 0.00135778 0.00137355 0.0014148
 0.00146773]
Centroid: [0.31404788 0.66317281 0.36394697]
x_new: [[0.31285212 0.66053081 0.36080011]]
fx_new [0.00121155]
Back to top
————————
xs: [[0.31252784 0.65908598 0.35957429]
 [0.31285212 0.66053081 0.36080011]
 [0.31433376 0.65905521 0.36268308]
 [0.31272811 0.66405693 0.3625922 ]
 [0.313848   0.6626475  0.36434865]
 [0.31651571 0.66432039 0.36627595]
 [0.31313807 0.66722883 0.36506078]]
fxs: [0.00117892 0.00121155 0.00128033 0.00128747 0.00135778 0.00137355
 0.0014148 ]
Centroid: [0.31370623 0.66241795 0.36304787]
x_new: [[0.31427439 0.65760707 0.36103496]]
fx_new [0.0012127]
Back to top
————————
xs: [[0.31252784 0.65908598 0.35957429]
 [0.31285212 0.66053081 0.36080011]
 [0.31427439 0.65760707 0.36103496]
 [0.31433376 0.65905521 0.36268308]
 [0.31272811 0.66405693 0.3625922 ]
 [0.313848   0.6626475  0.36434865]
 [0.31651571 0.66432039 0.36627595]]
fxs: [0.00117892 0.00121155 0.0012127  0.00128033 0.00128747 0.00135778
 0.00137355]
Centroid: [0.31386856 0.66104341 0.36247275]
x_new: [[0.31122141 0.65776644 0.35866954]]
fx_new [0.00121007]
Back to top
————————
xs: [[0.31252784 0.65908598 0.35957429]
 [0.31122141 0.65776644 0.35866954]
 [0.31285212 0.66053081 0.36080011]
 [0.31427439 0.65760707 0.36103496]
 [0.31433376 0.65905521 0.36268308]
 [0.31272811 0.66405693 0.3625922 ]
 [0.313848   0.6626475  0.36434865]]
fxs: [0.00117892 0.00121007 0.00121155 0.0012127  0.00128033 0.00128747
```

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 0.00135778]
Centroid: [0.31311223 0.66010713 0.36138612]
x_new: [[0.31237646 0.65756676 0.35842359]]
fx_new [0.00115152]
Expanding
————————————
xs: [[0.3116407  0.65502639 0.35546107]
 [0.31252784 0.65908598 0.35957429]
 [0.31122141 0.65776644 0.35866954]
 [0.31285212 0.66053081 0.36080011]
 [0.31427439 0.65760707 0.36103496]
 [0.31433376 0.65905521 0.36268308]
 [0.31272811 0.66405693 0.3625922 ]]
fxs: [0.0010957  0.00117892 0.00121007 0.00121155 0.0012127  0.00128033
 0.00128747]
Centroid: [0.3127969  0.6590184  0.36011646]
x_new: [[0.3128657  0.65397988 0.35764073]]
fx_new [0.00117073]
Back to top
————————————
xs: [[0.3116407  0.65502639 0.35546107]
 [0.3128657  0.65397988 0.35764073]
 [0.31252784 0.65908598 0.35957429]
 [0.31122141 0.65776644 0.35866954]
 [0.31285212 0.66053081 0.36080011]
 [0.31427439 0.65760707 0.36103496]
 [0.31433376 0.65905521 0.36268308]]
fxs: [0.0010957  0.00117073 0.00117892 0.00121007 0.00121155 0.0012127
 0.00128033]
Centroid: [0.31281656 0.65757883 0.35940911]
x_new: [[0.31129936 0.65610244 0.35613514]]
fx_new [0.00111702]
Back to top
————————————
xs: [[0.3116407  0.65502639 0.35546107]
 [0.31129936 0.65610244 0.35613514]
 [0.3128657  0.65397988 0.35764073]
 [0.31252784 0.65908598 0.35957429]
 [0.31122141 0.65776644 0.35866954]
 [0.31285212 0.66053081 0.36080011]
 [0.31427439 0.65760707 0.36103496]]
fxs: [0.0010957  0.00111702 0.00117073 0.00117892 0.00121007 0.00121155
 0.0012127 ]
Centroid: [0.31238307 0.657157   0.35847369]
x_new: [[0.31049175 0.65670693 0.35591242]]
fx_new [0.00113075]
Back to top
————————————
xs: [[0.3116407  0.65502639 0.35546107]
 [0.31129936 0.65610244 0.35613514]
 [0.31049175 0.65670693 0.35591242]
 [0.3128657  0.65397988 0.35764073]
 [0.31252784 0.65908598 0.35957429]
 [0.31122141 0.65776644 0.35866954]
 [0.31285212 0.66053081 0.36080011]]
fxs: [0.0010957  0.00111702 0.00113075 0.00117073 0.00117892 0.00121007
 0.00121155]
Centroid: [0.3118427  0.65702841 0.3577419 ]
x_new: [[0.31083327 0.65352601 0.35468369]]
fx_new [0.00113477]
Back to top
————————————
xs: [[0.3116407  0.65502639 0.35546107]
 [0.31129936 0.65610244 0.35613514]
 [0.31049175 0.65670693 0.35591242]
 [0.31083327 0.65352601 0.35468369]
 [0.3128657  0.65397988 0.35764073]
 [0.31252784 0.65908598 0.35957429]
 [0.31122141 0.65776644 0.35866954]]
fxs: [0.0010957  0.00111702 0.00113075 0.00113477 0.00117073 0.00117892
```

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 0.00121007]
Centroid: [0.31155429 0.65602773 0.35686812]
x_new: [[0.31188717 0.65428902 0.35506671]]
fx_new [0.00108548]
Expanding
————————
xs: [[0.31222005 0.6525503  0.35326529]
 [0.3116407  0.65502639 0.35546107]
 [0.31129936 0.65610244 0.35613514]
 [0.31049175 0.65670693 0.35591242]
 [0.31083327 0.65352601 0.35468369]
 [0.3128657  0.65397988 0.35764073]
 [0.31252784 0.65908598 0.35957429]]
fxs: [0.00104233 0.0010957  0.00111702 0.00113075 0.00113477 0.00117073
 0.00117892]
Centroid: [0.31169695 0.65528256 0.35609609]
x_new: [[0.31086607 0.65147915 0.35261789]]
fx_new [0.00110733]
Back to top
————————
xs: [[0.31222005 0.6525503  0.35326529]
 [0.3116407  0.65502639 0.35546107]
 [0.31086607 0.65147915 0.35261789]
 [0.31129936 0.65610244 0.35613514]
 [0.31049175 0.65670693 0.35591242]
 [0.31083327 0.65352601 0.35468369]
 [0.3128657  0.65397988 0.35764073]]
fxs: [0.00104233 0.0010957  0.00110733 0.00111702 0.00113075 0.00113477
 0.00117073]
Centroid: [0.31145956 0.65419587 0.35510232]
x_new: [[0.31005341 0.65441187 0.35256391]]
fx_new [0.00106195]
Back to top
————————
xs: [[0.31222005 0.6525503  0.35326529]
 [0.31005341 0.65441187 0.35256391]
 [0.3116407  0.65502639 0.35546107]
 [0.31086607 0.65147915 0.35261789]
 [0.31129936 0.65610244 0.35613514]
 [0.31049175 0.65670693 0.35591242]
 [0.31083327 0.65352601 0.35468369]]
fxs: [0.00104233 0.00106195 0.0010957  0.00110733 0.00111702 0.00113075
 0.00113477]
Centroid: [0.3110578  0.65425759 0.35437706]
x_new: [[0.31128233 0.65498916 0.35407043]]
fx_new [0.00105264]
Back to top
————————
xs: [[0.31222005 0.6525503  0.35326529]
 [0.31128233 0.65498916 0.35407043]
 [0.31005341 0.65441187 0.35256391]
 [0.3116407  0.65502639 0.35546107]
 [0.31086607 0.65147915 0.35261789]
 [0.31129936 0.65610244 0.35613514]
 [0.31049175 0.65670693 0.35591242]]
fxs: [0.00104233 0.00105264 0.00106195 0.0010957  0.00110733 0.00111702
 0.00113075]
Centroid: [0.31112195 0.65446661 0.35428945]
x_new: [[0.31175215 0.65222628 0.35266647]]
fx_new [0.00104804]
Back to top
————————
xs: [[0.31222005 0.6525503  0.35326529]
 [0.31175215 0.65222628 0.35266647]
 [0.31128233 0.65498916 0.35407043]
 [0.31005341 0.65441187 0.35256391]
 [0.3116407  0.65502639 0.35546107]
 [0.31086607 0.65147915 0.35261789]
 [0.31129936 0.65610244 0.35613514]]
fxs: [0.00104233 0.00104804 0.00105264 0.00106195 0.0010957  0.00110733
```

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 0.00111702]
Centroid: [0.31130201 0.65382651 0.35382574]
x_new: [[0.31130466 0.65155058 0.35151634]]
fx_new [0.00104438]
Back to top
——————————
xs: [[0.31222005 0.6525503  0.35326529]
 [0.31130466 0.65155058 0.35151634]
 [0.31175215 0.65222628 0.35266647]
 [0.31128233 0.65498916 0.35407043]
 [0.31005341 0.65441187 0.35256391]
 [0.3116407  0.65502639 0.35546107]
 [0.31086607 0.65147915 0.35261789]]
fxs: [0.00104233 0.00104438 0.00104804 0.00105264 0.00106195 0.0010957
 0.00110733]
Centroid: [0.31130276 0.65317625 0.35316591]
x_new: [[0.31173946 0.65487335 0.35371394]]
fx_new [0.00102075]
Expanding
——————————
xs: [[0.31217616 0.65657045 0.35426196]
 [0.31222005 0.6525503  0.35326529]
 [0.31130466 0.65155058 0.35151634]
 [0.31175215 0.65222628 0.35266647]
 [0.31128233 0.65498916 0.35407043]
 [0.31005341 0.65441187 0.35256391]
 [0.3116407  0.65502639 0.35546107]]
fxs: [0.00098757 0.00104233 0.00104438 0.00104804 0.00105264 0.00106195
 0.0010957 ]
Centroid: [0.31148992 0.65390358 0.35340078]
x_new: [[0.31133915 0.65278076 0.35134049]]
fx_new [0.00100082]
Back to top
——————————
xs: [[0.31217616 0.65657045 0.35426196]
 [0.31133915 0.65278076 0.35134049]
 [0.31222005 0.6525503  0.35326529]
 [0.31130466 0.65155058 0.35151634]
 [0.31175215 0.65222628 0.35266647]
 [0.31128233 0.65498916 0.35407043]
 [0.31005341 0.65441187 0.35256391]]
fxs: [0.00098757 0.00100082 0.00104233 0.00104438 0.00104804 0.00105264
 0.00106195]
Centroid: [0.31144684 0.65358277 0.35281213]
x_new: [[0.31284027 0.65275368 0.35306035]]
fx_new [0.00100269]
Back to top
——————————
xs: [[0.31217616 0.65657045 0.35426196]
 [0.31133915 0.65278076 0.35134049]
 [0.31284027 0.65275368 0.35306035]
 [0.31222005 0.6525503  0.35326529]
 [0.31130466 0.65155058 0.35151634]
 [0.31175215 0.65222628 0.35266647]
 [0.31128233 0.65498916 0.35407043]]
fxs: [0.00098757 0.00100082 0.00100269 0.00104233 0.00104438 0.00104804
 0.00105264]
Centroid: [0.31184497 0.65334589 0.35288305]
x_new: [[0.3124076  0.65170262 0.35169567]]
fx_new [0.00099898]
Back to top
——————————
xs: [[0.31217616 0.65657045 0.35426196]
 [0.3124076  0.65170262 0.35169567]
 [0.31133915 0.65278076 0.35134049]
 [0.31284027 0.65275368 0.35306035]
 [0.31222005 0.6525503  0.35326529]
 [0.31130466 0.65155058 0.35151634]
 [0.31175215 0.65222628 0.35266647]]
fxs: [0.00098757 0.00099898 0.00100082 0.00100269 0.00104233 0.00104438
```

```
 0.00104804]
Centroid: [0.31200572 0.65287638 0.3525438 ]
x_new: [[0.31225929 0.65352649 0.35242112]]
fx_new [0.00098112]
Expanding
————————
xs: [[0.31251286 0.65417659 0.35229845]
 [0.31217616 0.65657045 0.35426196]
 [0.3124076  0.65170262 0.35169567]
 [0.31133915 0.65278076 0.35134049]
 [0.31284027 0.65275368 0.35306035]
 [0.31222005 0.6525503  0.35326529]
 [0.31130466 0.65155058 0.35151634]]
fxs: [0.00094917 0.00098757 0.00099898 0.00100082 0.00100269 0.00104233
 0.00104438]
Centroid: [0.31211439 0.653155   0.35249122]
x_new: [[0.31292413 0.65475941 0.3534661 ]]
fx_new [0.00096365]
Back to top
————————
xs: [[0.31251286 0.65417659 0.35229845]
 [0.31292413 0.65475941 0.3534661 ]
 [0.31217616 0.65657045 0.35426196]
 [0.3124076  0.65170262 0.35169567]
 [0.31133915 0.65278076 0.35134049]
 [0.31284027 0.65275368 0.35306035]
 [0.31222005 0.6525503  0.35326529]]
fxs: [0.00094917 0.00096365 0.00098757 0.00099898 0.00100082 0.00100269
 0.00104233]
Centroid: [0.31234575 0.6536134  0.35276976]
x_new: [[0.31247145 0.6546765  0.35227423]]
fx_new [0.00093774]
Expanding
————————
xs: [[0.31259715 0.6557396  0.3517787 ]
 [0.31251286 0.65417659 0.35229845]
 [0.31292413 0.65475941 0.3534661 ]
 [0.31217616 0.65657045 0.35426196]
 [0.3124076  0.65170262 0.35169567]
 [0.31133915 0.65278076 0.35134049]
 [0.31284027 0.65275368 0.35306035]]
fxs: [0.00088962 0.00094917 0.00096365 0.00098757 0.00099898 0.00100082
 0.00100269]
Centroid: [0.31239962 0.65406902 0.35255739]
x_new: [[0.31195896 0.65538435 0.35205443]]
fx_new [0.00093463]
Back to top
————————
xs: [[0.31259715 0.6557396  0.3517787 ]
 [0.31195896 0.65538435 0.35205443]
 [0.31251286 0.65417659 0.35229845]
 [0.31292413 0.65475941 0.3534661 ]
 [0.31217616 0.65657045 0.35426196]
 [0.3124076  0.65170262 0.35169567]
 [0.31133915 0.65278076 0.35134049]]
fxs: [0.00088962 0.00093463 0.00094917 0.00096365 0.00098757 0.00099898
 0.00100082]
Centroid: [0.31227372 0.65444483 0.35241369]
x_new: [[0.31320829 0.65610889 0.35348688]]
fx_new [0.00092265]
Back to top
————————
xs: [[0.31259715 0.6557396  0.3517787 ]
 [0.31320829 0.65610889 0.35348688]
 [0.31195896 0.65538435 0.35205443]
 [0.31251286 0.65417659 0.35229845]
 [0.31292413 0.65475941 0.3534661 ]
 [0.31217616 0.65657045 0.35426196]
 [0.3124076  0.65170262 0.35169567]]
fxs: [0.00088962 0.00092265 0.00093463 0.00094917 0.00096365 0.00098757
```

```
 0.00099898]
Centroid: [0.31254074 0.65492027 0.35272031]
x_new: [[0.31267387 0.65813793 0.35374495]]
fx_new [0.00091619]
Back to top
————————
xs: [[0.31259715 0.6557396  0.3517787 ]
 [0.31267387 0.65813793 0.35374495]
 [0.31320829 0.65610889 0.35348688]
 [0.31195896 0.65538435 0.35205443]
 [0.31251286 0.65417659 0.35229845]
 [0.31292413 0.65475941 0.3534661 ]
 [0.31217616 0.65657045 0.35426196]]
fxs: [0.00088962 0.00091619 0.00092265 0.00093463 0.00094917 0.00096365
 0.00098757]
Centroid: [0.31257877 0.6558396  0.35301307]
x_new: [[0.31298139 0.65510875 0.35176417]]
fx_new [0.00088748]
Expanding
————————
xs: [[0.313384   0.6543779  0.35051528]
 [0.31259715 0.6557396  0.3517787 ]
 [0.31267387 0.65813793 0.35374495]
 [0.31320829 0.65610889 0.35348688]
 [0.31195896 0.65538435 0.35205443]
 [0.31251286 0.65417659 0.35229845]
 [0.31292413 0.65475941 0.3534661 ]]
fxs: [0.00084421 0.00088962 0.00091619 0.00092265 0.00093463 0.00094917
 0.00096365]
Centroid: [0.31275132 0.65552638 0.35247783]
x_new: [[0.31257851 0.65629335 0.35148955]]
fx_new [0.00086802]
Back to top
————————
xs: [[0.313384   0.6543779  0.35051528]
 [0.31257851 0.65629335 0.35148955]
 [0.31259715 0.6557396  0.3517787 ]
 [0.31267387 0.65813793 0.35374495]
 [0.31320829 0.65610889 0.35348688]
 [0.31195896 0.65538435 0.35205443]
 [0.31251286 0.65417659 0.35229845]]
fxs: [0.00084421 0.00086802 0.00088962 0.00091619 0.00092265 0.00093463
 0.00094917]
Centroid: [0.31270195 0.65574552 0.35219546]
x_new: [[0.31289103 0.65731444 0.35209248]]
fx_new [0.00085726]
Back to top
————————
xs: [[0.313384   0.6543779  0.35051528]
 [0.31289103 0.65731444 0.35209248]
 [0.31257851 0.65629335 0.35148955]
 [0.31259715 0.6557396  0.3517787 ]
 [0.31267387 0.65813793 0.35374495]
 [0.31320829 0.65610889 0.35348688]
 [0.31195896 0.65538435 0.35205443]]
fxs: [0.00084421 0.00085726 0.00086802 0.00088962 0.00091619 0.00092265
 0.00093463]
Centroid: [0.31275597 0.65619378 0.35216604]
x_new: [[0.31355298 0.65700321 0.35227765]]
fx_new [0.00084353]
Expanding
————————
xs: [[0.31434999 0.65781264 0.35238926]
 [0.313384   0.6543779  0.35051528]
 [0.31289103 0.65731444 0.35209248]
 [0.31257851 0.65629335 0.35148955]
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fxs: [0.00080189 0.00084421 0.00085726 0.00086802 0.00088962 0.00091619
```

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 0.00092265]
Centroid: [0.31309755 0.65654068 0.35221387]
x_new: [[0.31298681 0.65697247 0.35094087]]
fx_new [0.00081798]
Back to top
————————
xs: [[0.31434999 0.65781264 0.35238926]
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 [0.313384   0.6543779  0.35051528]
 [0.31289103 0.65731444 0.35209248]
 [0.31257851 0.65629335 0.35148955]
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 [0.31267387 0.65813793 0.35374495]]
fxs: [0.00080189 0.00081798 0.00084421 0.00085726 0.00086802 0.00088962
 0.00091619]
Centroid: [0.31306591 0.65666405 0.35185016]
x_new: [[0.31345795 0.65519017 0.34995536]]
fx_new [0.00080303]
Back to top
————————
xs: [[0.31434999 0.65781264 0.35238926]
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 [0.31298681 0.65697247 0.35094087]
 [0.313384   0.6543779  0.35051528]
 [0.31289103 0.65731444 0.35209248]
 [0.31257851 0.65629335 0.35148955]
 [0.31259715 0.6557396  0.3517787 ]]
fxs: [0.00080189 0.00080303 0.00081798 0.00084421 0.00085726 0.00086802
 0.00088962]
Centroid: [0.31317792 0.65624294 0.35130878]
x_new: [[0.3137587  0.65674628 0.35083887]]
fx_new [0.00078802]
Expanding
————————
xs: [[0.31433947 0.65724962 0.35036895]
 [0.31434999 0.65781264 0.35238926]
 [0.31345795 0.65519017 0.34995536]
 [0.31298681 0.65697247 0.35094087]
 [0.313384   0.6543779  0.35051528]
 [0.31289103 0.65731444 0.35209248]
 [0.31257851 0.65629335 0.35148955]]
fxs: [0.00073966 0.00080189 0.00080303 0.00081798 0.00084421 0.00085726
 0.00086802]
Centroid: [0.31342682 0.65645866 0.35110739]
x_new: [[0.31427513 0.65662396 0.35072523]]
fx_new [0.00076655]
Back to top
————————
xs: [[0.31433947 0.65724962 0.35036895]
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 [0.31434999 0.65781264 0.35238926]
 [0.31345795 0.65519017 0.34995536]
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 [0.313384   0.6543779  0.35051528]
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fxs: [0.00073966 0.00076655 0.00080189 0.00080303 0.00081798 0.00084421
 0.00085726]
Centroid: [0.3136692  0.65650589 0.3509982 ]
x_new: [[0.31444736 0.65569733 0.34990393]]
fx_new [0.00075159]
Back to top
————————
xs: [[0.31433947 0.65724962 0.35036895]
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 [0.31427513 0.65662396 0.35072523]
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fxs: [0.00073966 0.00075159 0.00076655 0.00080189 0.00080303 0.00081798
```

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 0.00084421]
Centroid: [0.31389153 0.65627487 0.35068555]
x_new: [[0.31439907 0.65817183 0.35085583]]
fx_new [0.00073771]
Expanding
————————
xs: [[0.3149066  0.6600688  0.3510261 ]
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 [0.31444736 0.65569733 0.34990393]
 [0.31427513 0.65662396 0.35072523]
 [0.31434999 0.65781264 0.35238926]
 [0.31345795 0.65519017 0.34995536]
 [0.31298681 0.65697247 0.35094087]]
fxs: [0.00069611 0.00073966 0.00075159 0.00076655 0.00080189 0.00080303
 0.00081798]
Centroid: [0.31410905 0.65708785 0.35075853]
x_new: [[0.31523128 0.65720324 0.35057619]]
fx_new [0.00071456]
Back to top
————————
xs: [[0.3149066  0.6600688  0.3510261 ]
 [0.31523128 0.65720324 0.35057619]
 [0.31433947 0.65724962 0.35036895]
 [0.31444736 0.65569733 0.34990393]
 [0.31427513 0.65662396 0.35072523]
 [0.31434999 0.65781264 0.35238926]
 [0.31345795 0.65519017 0.34995536]]
fxs: [0.00069611 0.00071456 0.00073966 0.00075159 0.00076655 0.00080189
 0.00080303]
Centroid: [0.31442968 0.65712082 0.35070643]
x_new: [[0.31540142 0.65905148 0.3514575 ]]
fx_new [0.00070803]
Back to top
————————
xs: [[0.3149066  0.6600688  0.3510261 ]
 [0.31540142 0.65905148 0.3514575 ]
 [0.31523128 0.65720324 0.35057619]
 [0.31433947 0.65724962 0.35036895]
 [0.31444736 0.65569733 0.34990393]
 [0.31427513 0.65662396 0.35072523]
 [0.31434999 0.65781264 0.35238926]]
fxs: [0.00069611 0.00070803 0.00071456 0.00073966 0.00075159 0.00076655
 0.00080189]
Centroid: [0.31470732 0.65767244 0.35092102]
x_new: [[0.31506465 0.65753224 0.34945279]]
fx_new [0.00067702]
Expanding
————————
xs: [[0.31542198 0.65739204 0.34798455]
 [0.3149066  0.6600688  0.3510261 ]
 [0.31540142 0.65905148 0.3514575 ]
 [0.31523128 0.65720324 0.35057619]
 [0.31433947 0.65724962 0.35036895]
 [0.31444736 0.65569733 0.34990393]
 [0.31427513 0.65662396 0.35072523]]
fxs: [0.00062149 0.00069611 0.00070803 0.00071456 0.00073966 0.00075159
 0.00076655]
Centroid: [0.31486046 0.65761235 0.35029178]
x_new: [[0.31544579 0.65860074 0.34985833]]
fx_new [0.0006581]
Back to top
————————
xs: [[0.31542198 0.65739204 0.34798455]
 [0.31544579 0.65860074 0.34985833]
 [0.3149066  0.6600688  0.3510261 ]
 [0.31540142 0.65905148 0.3514575 ]
 [0.31523128 0.65720324 0.35057619]
 [0.31433947 0.65724962 0.35036895]
 [0.31444736 0.65569733 0.34990393]]
fxs: [0.00062149 0.0006581  0.00069611 0.00070803 0.00071456 0.00073966
```

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 0.00075159]
Centroid: [0.3150277  0.65789475 0.35016794]
x_new: [[0.31560804 0.66009217 0.35043195]]
fx_new [0.00064977]
Back to top
——————————
xs: [[0.31542198 0.65739204 0.34798455]
 [0.31560804 0.66009217 0.35043195]
 [0.31544579 0.65860074 0.34985833]
 [0.3149066  0.6600688  0.3510261 ]
 [0.31540142 0.65905148 0.3514575 ]
 [0.31523128 0.65720324 0.35057619]
 [0.31433947 0.65724962 0.35036895]]
fxs: [0.00062149 0.00064977 0.0006581  0.00069611 0.00070803 0.00071456
 0.00073966]
Centroid: [0.31519351 0.65852258 0.35024337]
x_new: [[0.31604755 0.65979555 0.35011778]]
fx_new [0.00062773]
Back to top
——————————
xs: [[0.31542198 0.65739204 0.34798455]
 [0.31604755 0.65979555 0.35011778]
 [0.31560804 0.66009217 0.35043195]
 [0.31544579 0.65860074 0.34985833]
 [0.3149066  0.6600688  0.3510261 ]
 [0.31540142 0.65905148 0.3514575 ]
 [0.31523128 0.65720324 0.35057619]]
fxs: [0.00062149 0.00062773 0.00064977 0.0006581  0.00069611 0.00070803
 0.00071456]
Centroid: [0.31543752 0.65888629 0.35020749]
x_new: [[0.31564377 0.66056933 0.34983878]]
fx_new [0.00062253]
Back to top
——————————
xs: [[0.31542198 0.65739204 0.34798455]
 [0.31564377 0.66056933 0.34983878]
 [0.31604755 0.65979555 0.35011778]
 [0.31560804 0.66009217 0.35043195]
 [0.31544579 0.65860074 0.34985833]
 [0.3149066  0.6600688  0.3510261 ]
 [0.31540142 0.65905148 0.3514575 ]]
fxs: [0.00062149 0.00062253 0.00062773 0.00064977 0.0006581  0.00069611
 0.00070803]
Centroid: [0.31549645 0.65936716 0.35010214]
x_new: [[0.31559148 0.65968284 0.34874678]]
fx_new [0.00060112]
Expanding
——————————
xs: [[0.31568651 0.65999852 0.34739142]
 [0.31542198 0.65739204 0.34798455]
 [0.31564377 0.66056933 0.34983878]
 [0.31604755 0.65979555 0.35011778]
 [0.31560804 0.66009217 0.35043195]
 [0.31544579 0.65860074 0.34985833]
 [0.3149066  0.6600688  0.3510261 ]]
fxs: [0.0005535  0.00062149 0.00062253 0.00062773 0.00064977 0.0006581
 0.00069611]
Centroid: [0.31553718 0.65950245 0.34952127]
x_new: [[0.31616776 0.6589361  0.34801645]]
fx_new [0.00057001]
Back to top
——————————
xs: [[0.31568651 0.65999852 0.34739142]
 [0.31616776 0.6589361  0.34801645]
 [0.31542198 0.65739204 0.34798455]
 [0.31564377 0.66056933 0.34983878]
 [0.31604755 0.65979555 0.35011778]
 [0.31560804 0.66009217 0.35043195]
 [0.31544579 0.65860074 0.34985833]]
fxs: [0.0005535  0.00057001 0.00062149 0.00062253 0.00062773 0.00064977
```

```
0.0006581 ]
Centroid: [0.31571734 0.65934064 0.34909132]
x_new: [[0.31598889 0.66008053 0.34832432]]
fx_new [0.00056894]
Back to top
————————
xs: [[0.31568651 0.65999852 0.34739142]
 [0.31598889 0.66008053 0.34832432]
 [0.31616776 0.6589361  0.34801645]
 [0.31542198 0.65739204 0.34798455]
 [0.31564377 0.66056933 0.34983878]
 [0.31604755 0.65979555 0.35011778]
 [0.31560804 0.66009217 0.35043195]]
fxs: [0.0005535  0.00056894 0.00057001 0.00062149 0.00062253 0.00062773
 0.00064977]
Centroid: [0.31579493 0.65955203 0.34887218]
x_new: [[0.31598182 0.6590119  0.34731241]]
fx_new [0.00055509]
Back to top
————————
xs: [[0.31568651 0.65999852 0.34739142]
 [0.31598182 0.6590119  0.34731241]
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 [0.31616776 0.6589361  0.34801645]
 [0.31542198 0.65739204 0.34798455]
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 [0.31604755 0.65979555 0.35011778]]
fxs: [0.0005535  0.00055509 0.00056894 0.00057001 0.00062149 0.00062253
 0.00062773]
Centroid: [0.31584833 0.65939771 0.34842653]
x_new: [[0.3156491  0.65899987 0.34673528]]
fx_new [0.00055112]
Expanding
————————
xs: [[0.31544987 0.65860204 0.34504403]
 [0.31568651 0.65999852 0.34739142]
 [0.31598182 0.6590119  0.34731241]
 [0.31598889 0.66008053 0.34832432]
 [0.31616776 0.6589361  0.34801645]
 [0.31542198 0.65739204 0.34798455]
 [0.31564377 0.66056933 0.34983878]]
fxs: [0.000522   0.0005535  0.00055509 0.00056894 0.00057001 0.00062149
 0.00062253]
Centroid: [0.31576294 0.65922721 0.34770171]
x_new: [[0.31588212 0.65788508 0.34556463]]
fx_new [0.00053127]
Back to top
————————
xs: [[0.31544987 0.65860204 0.34504403]
 [0.31588212 0.65788508 0.34556463]
 [0.31568651 0.65999852 0.34739142]
 [0.31598182 0.6590119  0.34731241]
 [0.31598889 0.66008053 0.34832432]
 [0.31616776 0.6589361  0.34801645]
 [0.31542198 0.65739204 0.34798455]]
fxs: [0.000522   0.00053127 0.0005535  0.00055509 0.00056894 0.00057001
 0.00062149]
Centroid: [0.315797   0.65884374 0.34709112]
x_new: [[0.31617201 0.66029545 0.34619768]]
fx_new [0.00050059]
Expanding
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xs: [[0.31654702 0.66174716 0.34530424]
 [0.31544987 0.65860204 0.34504403]
 [0.31588212 0.65788508 0.34556463]
 [0.31568651 0.65999852 0.34739142]
 [0.31598182 0.6590119  0.34731241]
 [0.31598889 0.66008053 0.34832432]
 [0.31616776 0.6589361  0.34801645]]
fxs: [0.00044928 0.000522   0.00053127 0.0005535  0.00055509 0.00056894
```

```
  0.00057001]
Centroid: [0.31595772 0.6594659  0.34670821]
x_new: [[0.31574767 0.65999571 0.34539998]]
fx_new [0.00049936]
Back to top
————————
xs: [[0.31654702 0.66174716 0.34530424]
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 [0.31588212 0.65788508 0.34556463]
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 [0.31598182 0.6590119  0.34731241]
 [0.31598889 0.66008053 0.34832432]]
fxs: [0.00044928 0.00049936 0.000522   0.00053127 0.0005535  0.00055509
 0.00056894]
Centroid: [0.3158977  0.65961728 0.34633443]
x_new: [[0.31580651 0.65915402 0.34434455]]
fx_new [0.00048488]
Back to top
————————
xs: [[0.31654702 0.66174716 0.34530424]
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 [0.31598182 0.6590119  0.34731241]]
fxs: [0.00044928 0.00048488 0.00049936 0.000522   0.00053127 0.0005535
 0.00055509]
Centroid: [0.31587165 0.65948492 0.34576589]
x_new: [[0.31576148 0.65995794 0.34421938]]
fx_new [0.00047228]
Back to top
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xs: [[0.31654702 0.66174716 0.34530424]
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 [0.31588212 0.65788508 0.34556463]
 [0.31568651 0.65999852 0.34739142]]
fxs: [0.00044928 0.00047228 0.00048488 0.00049936 0.000522   0.00053127
 0.0005535 ]
Centroid: [0.31584017 0.65962007 0.34532403]
x_new: [[0.31599383 0.65924161 0.34325665]]
fx_new [0.00045426]
Back to top
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xs: [[0.31654702 0.66174716 0.34530424]
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 [0.31576148 0.65995794 0.34421938]
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 [0.31588212 0.65788508 0.34556463]]
fxs: [0.00044928 0.00045426 0.00047228 0.00048488 0.00049936 0.000522
 0.00053127]
Centroid: [0.31588407 0.65951194 0.34473335]
x_new: [[0.31588602 0.66113879 0.34390207]]
fx_new [0.00044666]
Expanding
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xs: [[0.31588797 0.66276564 0.34307078]
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fxs: [0.00041438 0.00044928 0.00045426 0.00047228 0.00048488 0.00049936
```

```
0.000522   ]
Centroid: [0.31588491 0.66020916 0.34437709]
x_new: [[0.31631994 0.66181628 0.34371015]]
fx_new [0.00042066]
Back to top
————————
xs: [[0.31588797 0.66276564 0.34307078]
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 [0.31599383 0.65924161 0.34325665]
 [0.31576148 0.65995794 0.34421938]
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 [0.31574767 0.65999571 0.34539998]]
fxs: [0.00041438 0.00042066 0.00044928 0.00045426 0.00047228 0.00048488
 0.00049936]
Centroid: [0.3160092  0.66066834 0.34418653]
x_new: [[0.31627073 0.66134097 0.34297308]]
fx_new [0.00041242]
Expanding
————————
xs: [[0.31653226 0.6620136  0.34175963]
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 [0.31654702 0.66174716 0.34530424]
 [0.31599383 0.65924161 0.34325665]
 [0.31576148 0.65995794 0.34421938]
 [0.31580651 0.65915402 0.34434455]]
fxs: [0.00037493 0.00041438 0.00042066 0.00044928 0.00045426 0.00047228
 0.00048488]
Centroid: [0.31612129 0.66095661 0.34366648]
x_new: [[0.31643606 0.66275919 0.34298842]]
fx_new [0.00039401]
Back to top
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 [0.31654702 0.66174716 0.34530424]
 [0.31599383 0.65924161 0.34325665]
 [0.31576148 0.65995794 0.34421938]]
fxs: [0.00037493 0.00039401 0.00041438 0.00042066 0.00044928 0.00045426
 0.00047228]
Centroid: [0.31621122 0.66147163 0.34347275]
x_new: [[0.31666097 0.66298533 0.34272612]]
fx_new [0.00037974]
Back to top
————————
xs: [[0.31653226 0.6620136  0.34175963]
 [0.31666097 0.66298533 0.34272612]
 [0.31643606 0.66275919 0.34298842]
 [0.31588797 0.66276564 0.34307078]
 [0.31631994 0.66181628 0.34371015]
 [0.31654702 0.66174716 0.34530424]
 [0.31599383 0.65924161 0.34325665]]
fxs: [0.00037493 0.00037974 0.00039401 0.00041438 0.00042066 0.00044928
 0.00045426]
Centroid: [0.31633972 0.66190412 0.34325943]
x_new: [[0.31668562 0.66456662 0.34326221]]
fx_new [0.00038014]
Back to top
————————
xs: [[0.31653226 0.6620136  0.34175963]
 [0.31666097 0.66298533 0.34272612]
 [0.31668562 0.66456662 0.34326221]
 [0.31643606 0.66275919 0.34298842]
 [0.31588797 0.66276564 0.34307078]
 [0.31631994 0.66181628 0.34371015]
 [0.31654702 0.66174716 0.34530424]]
fxs: [0.00037493 0.00037974 0.00038014 0.00039401 0.00041438 0.00042066
```

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 0.00044928]
Centroid: [0.31643855 0.66266483 0.34326022]
x_new: [[0.31633008 0.66358251 0.3412162 ]]
fx_new [0.00036076]
Expanding
————————————
xs: [[0.31622161 0.66450018 0.33917218]
 [0.31653226 0.6620136  0.34175963]
 [0.31666097 0.66298533 0.34272612]
 [0.31668562 0.66456662 0.34326221]
 [0.31643606 0.66275919 0.34298842]
 [0.31588797 0.66276564 0.34307078]
 [0.31631994 0.66181628 0.34371015]]
fxs: [0.0003316  0.00037493 0.00037974 0.00038014 0.00039401 0.00041438
 0.00042066]
Centroid: [0.31639206 0.66305812 0.34238421]
x_new: [[0.31646418 0.66429996 0.34105828]]
fx_new [0.00034984]
Back to top
————————————
xs: [[0.31622161 0.66450018 0.33917218]
 [0.31646418 0.66429996 0.34105828]
 [0.31653226 0.6620136  0.34175963]
 [0.31666097 0.66298533 0.34272612]
 [0.31668562 0.66456662 0.34326221]
 [0.31643606 0.66275919 0.34298842]
 [0.31588797 0.66276564 0.34307078]]
fxs: [0.0003316  0.00034984 0.00037493 0.00037974 0.00038014 0.00039401
 0.00041438]
Centroid: [0.31641267 0.66341293 0.34200538]
x_new: [[0.31693736 0.66406022 0.34093997]]
fx_new [0.00033348]
Back to top
————————————
xs: [[0.31622161 0.66450018 0.33917218]
 [0.31693736 0.66406022 0.34093997]
 [0.31646418 0.66429996 0.34105828]
 [0.31653226 0.6620136  0.34175963]
 [0.31666097 0.66298533 0.34272612]
 [0.31668562 0.66456662 0.34326221]
 [0.31643606 0.66275919 0.34298842]]
fxs: [0.0003316  0.00033348 0.00034984 0.00037493 0.00037974 0.00038014
 0.00039401]
Centroid: [0.31656258 0.66359787 0.34170097]
x_new: [[0.3166891  0.66443655 0.34041353]]
fx_new [0.00033213]
Back to top
————————————
xs: [[0.31622161 0.66450018 0.33917218]
 [0.3166891  0.66443655 0.34041353]
 [0.31693736 0.66406022 0.34093997]
 [0.31646418 0.66429996 0.34105828]
 [0.31653226 0.6620136  0.34175963]
 [0.31666097 0.66298533 0.34272612]
 [0.31668562 0.66456662 0.34326221]]
fxs: [0.0003316  0.00033213 0.00033348 0.00034984 0.00037493 0.00037974
 0.00038014]
Centroid: [0.31659873 0.6638375  0.34133313]
x_new: [[0.31651184 0.66310837 0.33940406]]
fx_new [0.00033248]
Back to top
————————————
xs: [[0.31622161 0.66450018 0.33917218]
 [0.3166891  0.66443655 0.34041353]
 [0.31651184 0.66310837 0.33940406]
 [0.31693736 0.66406022 0.34093997]
 [0.31646418 0.66429996 0.34105828]
 [0.31653226 0.6620136  0.34175963]
 [0.31666097 0.66298533 0.34272612]]
fxs: [0.0003316  0.00033213 0.00033248 0.00033348 0.00034984 0.00037493
```

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 0.00037974]
Centroid: [0.3165739  0.66362917 0.34078197]
x_new: [[0.31648684 0.66427302 0.33883781]]
fx_new [0.00031983]
Expanding
————————
xs: [[0.31639977 0.66491686 0.33689366]
 [0.31622161 0.66450018 0.33917218]
 [0.3166891  0.66443655 0.34041353]
 [0.31651184 0.66310837 0.33940406]
 [0.31693736 0.66406022 0.34093997]
 [0.31646418 0.66429996 0.34105828]
 [0.31653226 0.6620136  0.34175963]]
fxs: [0.00030248 0.0003316  0.00033213 0.00033248 0.00033348 0.00034984
 0.00037493]
Centroid: [0.31653659 0.66390511 0.33994876]
x_new: [[0.31654092 0.66579661 0.33813788]]
fx_new [0.00030583]
Back to top
————————
xs: [[0.31639977 0.66491686 0.33689366]
 [0.31654092 0.66579661 0.33813788]
 [0.31622161 0.66450018 0.33917218]
 [0.3166891  0.66443655 0.34041353]
 [0.31651184 0.66310837 0.33940406]
 [0.31693736 0.66406022 0.34093997]
 [0.31646418 0.66429996 0.34105828]]
fxs: [0.00030248 0.00030583 0.0003316  0.00033213 0.00033248 0.00033348
 0.00034984]
Centroid: [0.31653783 0.66444554 0.33943137]
x_new: [[0.31661147 0.66459111 0.33780445]]
fx_new [0.00030392]
Back to top
————————
xs: [[0.31639977 0.66491686 0.33689366]
 [0.31661147 0.66459111 0.33780445]
 [0.31654092 0.66579661 0.33813788]
 [0.31622161 0.66450018 0.33917218]
 [0.3166891  0.66443655 0.34041353]
 [0.31651184 0.66310837 0.33940406]
 [0.31693736 0.66406022 0.34093997]]
fxs: [0.00030248 0.00030392 0.00030583 0.0003316  0.00033213 0.00033248
 0.00033348]
Centroid: [0.31655887 0.66448713 0.33896653]
x_new: [[0.31618037 0.66491404 0.3369931 ]]
fx_new [0.00031069]
Back to top
————————
xs: [[0.31639977 0.66491686 0.33689366]
 [0.31661147 0.66459111 0.33780445]
 [0.31654092 0.66579661 0.33813788]
 [0.31618037 0.66491404 0.3369931 ]
 [0.31622161 0.66450018 0.33917218]
 [0.3166891  0.66443655 0.34041353]
 [0.31651184 0.66310837 0.33940406]]
fxs: [0.00030248 0.00030392 0.00030583 0.00031069 0.0003316  0.00033213
 0.00033248]
Centroid: [0.31645072 0.6646091  0.33840269]
x_new: [[0.31638961 0.66610984 0.33740133]]
fx_new [0.00030395]
Back to top
————————
xs: [[0.31639977 0.66491686 0.33689366]
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 [0.31654092 0.66579661 0.33813788]
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 [0.31622161 0.66450018 0.33917218]
 [0.3166891  0.66443655 0.34041353]]
fxs: [0.00030248 0.00030392 0.00030395 0.00030583 0.00031069 0.0003316
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 0.00033213]
Centroid: [0.31643326 0.66503789 0.33811659]
x_new: [[0.31617742 0.66563922 0.33581965]]
fx_new [0.00030156]
Expanding
————————————
xs: [[0.31617742 0.66563922 0.33581965]
 [0.31639977 0.66491686 0.33689366]
 [0.31661147 0.66459111 0.33780445]
 [0.31638961 0.66610984 0.33740133]
 [0.31654092 0.66579661 0.33813788]
 [0.31618037 0.66491404 0.3369931 ]
 [0.31622161 0.66450018 0.33917218]]
fxs: [0.00030156 0.00030248 0.00030392 0.00030395 0.00030583 0.00031069
 0.0003316 ]
Centroid: [0.31636017 0.6652097  0.33746032]
x_new: [[0.31649873 0.66591921 0.33574846]]
fx_new [0.0002898]
Expanding
————————————
xs: [[0.31663729 0.66662873 0.3340366 ]
 [0.31617742 0.66563922 0.33581965]
 [0.31639977 0.66491686 0.33689366]
 [0.31661147 0.66459111 0.33780445]
 [0.31638961 0.66610984 0.33740133]
 [0.31654092 0.66579661 0.33813788]
 [0.31618037 0.66491404 0.3369931 ]]
fxs: [0.00027925 0.00030156 0.00030248 0.00030392 0.00030395 0.00030583
 0.00031069]
Centroid: [0.31641955 0.66551377 0.33672667]
x_new: [[0.31665873 0.66611351 0.33646024]]
fx_new [0.00028813]
Back to top
————————————
xs: [[0.31663729 0.66662873 0.3340366 ]
 [0.31665873 0.66611351 0.33646024]
 [0.31617742 0.66563922 0.33581965]
 [0.31639977 0.66491686 0.33689366]
 [0.31661147 0.66459111 0.33780445]
 [0.31638961 0.66610984 0.33740133]
 [0.31654092 0.66579661 0.33813788]]
fxs: [0.00027925 0.00028813 0.00030156 0.00030248 0.00030392 0.00030395
 0.00030583]
Centroid: [0.31648789 0.66568513 0.33665055]
x_new: [[0.31643486 0.66557364 0.33516321]]
fx_new [0.0002901]
Back to top
————————————
xs: [[0.31663729 0.66662873 0.3340366 ]
 [0.31665873 0.66611351 0.33646024]
 [0.31643486 0.66557364 0.33516321]
 [0.31617742 0.66563922 0.33581965]
 [0.31639977 0.66491686 0.33689366]
 [0.31661147 0.66459111 0.33780445]
 [0.31638961 0.66610984 0.33740133]]
fxs: [0.00027925 0.00028813 0.0002901  0.00030156 0.00030248 0.00030392
 0.00030395]
Centroid: [0.31647273 0.66565327 0.33622559]
x_new: [[0.31655586 0.66519671 0.33504985]]
fx_new [0.00028659]
Back to top
————————————
xs: [[0.31663729 0.66662873 0.3340366 ]
 [0.31655586 0.66519671 0.33504985]
 [0.31665873 0.66611351 0.33646024]
 [0.31643486 0.66557364 0.33516321]
 [0.31617742 0.66563922 0.33581965]
 [0.31639977 0.66491686 0.33689366]
 [0.31661147 0.66459111 0.33780445]]
fxs: [0.00027925 0.00028659 0.00028813 0.0002901  0.00030156 0.00030248
```

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0.00030392]
Centroid: [0.31649649 0.66552283 0.33588967]
x_new: [[0.3163815   0.66645454 0.33397488]]
fx_new [0.00028782]
Back to top
————————
xs: [[0.31663729 0.66662873 0.3340366 ]
 [0.31655586 0.66519671 0.33504985]
 [0.3163815   0.66645454 0.33397488]
 [0.31665873 0.66611351 0.33646024]
 [0.31643486 0.66557364 0.33516321]
 [0.31617742 0.66563922 0.33581965]
 [0.31639977 0.66491686 0.33689366]]
fxs: [0.00027925 0.00028659 0.00028782 0.00028813 0.0002901  0.00030156
 0.00030248]
Centroid: [0.31646363 0.66578903 0.33534258]
x_new: [[0.3165275   0.66666119 0.33379151]]
fx_new [0.00028265]
Back to top
————————
xs: [[0.31663729 0.66662873 0.3340366 ]
 [0.3165275   0.66666119 0.33379151]
 [0.31655586 0.66519671 0.33504985]
 [0.3163815   0.66645454 0.33397488]
 [0.31665873 0.66611351 0.33646024]
 [0.31643486 0.66557364 0.33516321]
 [0.31617742 0.66563922 0.33581965]]
fxs: [0.00027925 0.00028265 0.00028659 0.00028782 0.00028813 0.0002901
 0.00030156]
Centroid: [0.31648188 0.66603822 0.33489942]
x_new: [[0.31678633 0.66643722 0.33397919]]
fx_new [0.00027427]
Expanding
————————
xs: [[0.31709079 0.66683621 0.33305896]
 [0.31663729 0.66662873 0.3340366 ]
 [0.3165275   0.66666119 0.33379151]
 [0.31655586 0.66519671 0.33504985]
 [0.3163815   0.66645454 0.33397488]
 [0.31665873 0.66611351 0.33646024]
 [0.31643486 0.66557364 0.33516321]]
fxs: [0.00026392 0.00027925 0.00028265 0.00028659 0.00028782 0.00028813
 0.0002901 ]
Centroid: [0.31661236 0.66620922 0.33450503]
x_new: [[0.31678986 0.6668448   0.33384686]]
fx_new [0.00027398]
Back to top
————————
xs: [[0.31709079 0.66683621 0.33305896]
 [0.31678986 0.6668448   0.33384686]
 [0.31663729 0.66662873 0.3340366 ]
 [0.3165275   0.66666119 0.33379151]
 [0.31655586 0.66519671 0.33504985]
 [0.3163815   0.66645454 0.33397488]
 [0.31665873 0.66611351 0.33646024]]
fxs: [0.00026392 0.00027398 0.00027925 0.00028265 0.00028659 0.00028782
 0.00028813]
Centroid: [0.31666308 0.66639081 0.33431699]
x_new: [[0.31666742 0.66666811 0.33217373]]
fx_new [0.0002791]
Back to top
————————
xs: [[0.31709079 0.66683621 0.33305896]
 [0.31678986 0.6668448   0.33384686]
 [0.31666742 0.66666811 0.33217373]
 [0.31663729 0.66662873 0.3340366 ]
 [0.3165275   0.66666119 0.33379151]
 [0.31655586 0.66519671 0.33504985]
 [0.3163815   0.66645454 0.33397488]]
fxs: [0.00026392 0.00027398 0.0002791  0.00027925 0.00028265 0.00028659
```

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5023     0.00028782]
5024  Centroid: [0.31666432 0.66647004 0.33370463]
5025  x_new: [[0.31694713 0.66648554 0.33343437]]
5026  fx_new [0.00026855]
5027  Back to top
5028  ——————————
5029  xs: [[0.31709079 0.66683621 0.33305896]
5030   [0.31694713 0.66648554 0.33343437]
5031   [0.31678986 0.6668448  0.33384686]
5032   [0.31666742 0.66666811 0.33217373]
5033   [0.31663729 0.66662873 0.3340366 ]
5034   [0.3165275  0.66666119 0.33379151]
5035   [0.31655586 0.66519671 0.33504985]]
5036  fxs: [0.00026392 0.00026855 0.00027398 0.0002791  0.00027925 0.00028265
5037   0.00028659]
5038  Centroid: [0.31674512 0.66647447 0.33362741]
5039  x_new: [[0.31693438 0.66775224 0.33220497]]
5040  fx_new [0.00027138]
5041  Back to top
5042  ——————————
5043  xs: [[0.31709079 0.66683621 0.33305896]
5044   [0.31694713 0.66648554 0.33343437]
5045   [0.31693438 0.66775224 0.33220497]
5046   [0.31678986 0.6668448  0.33384686]
5047   [0.31666742 0.66666811 0.33217373]
5048   [0.31663729 0.66662873 0.3340366 ]
5049   [0.3165275  0.66666119 0.33379151]]
5050  fxs: [0.00026392 0.00026855 0.00027138 0.00027398 0.0002791  0.00027925
5051   0.00028265]
5052  Centroid: [0.3167992  0.66683955 0.333221  ]
5053  x_new: [[0.31707089 0.6670179  0.33265049]]
5054  fx_new [0.00026506]
5055  Back to top
5056  ——————————
5057  xs: [[0.31709079 0.66683621 0.33305896]
5058   [0.31707089 0.6670179  0.33265049]
5059   [0.31694713 0.66648554 0.33343437]
5060   [0.31693438 0.66775224 0.33220497]
5061   [0.31678986 0.6668448  0.33384686]
5062   [0.31666742 0.66666811 0.33217373]
5063   [0.31663729 0.66662873 0.3340366 ]]
5064  fxs: [0.00026392 0.00026506 0.00026855 0.00027138 0.00027398 0.0002791
5065   0.00027925]
5066  Centroid: [0.31687682 0.6668905  0.333058  ]
5067  x_new: [[0.31711636 0.66715228 0.3320794 ]]
5068  fx_new [0.0002648]
5069  Back to top
5070  ——————————
5071  xs: [[0.31709079 0.66683621 0.33305896]
5072   [0.31711636 0.66715228 0.3320794 ]
5073   [0.31707089 0.6670179  0.33265049]
5074   [0.31694713 0.66648554 0.33343437]
5075   [0.31693438 0.66775224 0.33220497]
5076   [0.31678986 0.6668448  0.33384686]
5077   [0.31666742 0.66666811 0.33217373]]
5078  fxs: [0.00026392 0.0002648  0.00026506 0.00026855 0.00027138 0.00027398
5079   0.0002791 ]
5080  Centroid: [0.31694526 0.6669653  0.3327784 ]
5081  x_new: [[0.3172231  0.66726248 0.33338306]]
5082  fx_new [0.0002599]
5083  Expanding
5084  ——————————
5085  xs: [[0.31750095 0.66755967 0.33398773]
5086   [0.31709079 0.66683621 0.33305896]
5087   [0.31711636 0.66715228 0.3320794 ]
5088   [0.31707089 0.6670179  0.33265049]
5089   [0.31694713 0.66648554 0.33343437]
5090   [0.31693438 0.66775224 0.33220497]
5091   [0.31678986 0.6668448  0.33384686]]
5092  fxs: [0.00025189 0.00026392 0.0002648  0.00026506 0.00026855 0.00027138
```

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```
0.00027398]
Centroid: [0.31706434 0.66709266 0.33303754]
x_new: [[0.31733881 0.66734053 0.33222822]]
fx_new [0.0002575]
Back to top
————————————
xs: [[0.31750095 0.66755967 0.33398773]
 [0.31733881 0.66734053 0.33222822]
 [0.31709079 0.66683621 0.33305896]
 [0.31711636 0.66715228 0.3320794 ]
 [0.31707089 0.6670179  0.33265049]
 [0.31694713 0.66648554 0.33343437]
 [0.31693438 0.66775224 0.33220497]]
fxs: [0.00025189 0.0002575  0.00026392 0.0002648  0.00026506 0.00026855
 0.00027138]
Centroid: [0.31714276 0.66716348 0.33280631]
x_new: [[0.31735114 0.66657473 0.33340764]]
fx_new [0.00025544]
Back to top
————————————
xs: [[0.31750095 0.66755967 0.33398773]
 [0.31735114 0.66657473 0.33340764]
 [0.31733881 0.66734053 0.33222822]
 [0.31709079 0.66683621 0.33305896]
 [0.31711636 0.66715228 0.3320794 ]
 [0.31707089 0.6670179  0.33265049]
 [0.31694713 0.66648554 0.33343437]]
fxs: [0.00025189 0.00025544 0.0002575  0.00026392 0.0002648  0.00026506
 0.00026855]
Centroid: [0.3172023  0.66699527 0.33297812]
x_new: [[0.31745746 0.66750499 0.33252186]]
fx_new [0.0002534]
Back to top
————————————
xs: [[0.31750095 0.66755967 0.33398773]
 [0.31745746 0.66750499 0.33252186]
 [0.31735114 0.66657473 0.33340764]
 [0.31733881 0.66734053 0.33222822]
 [0.31709079 0.66683621 0.33305896]
 [0.31711636 0.66715228 0.3320794 ]
 [0.31707089 0.6670179  0.33265049]]
fxs: [0.00025189 0.0002534  0.00025544 0.0002575  0.00026392 0.0002648
 0.00026506]
Centroid: [0.3172752  0.6671409  0.33284776]
x_new: [[0.31747951 0.6672639  0.33304502]]
fx_new [0.00025178]
Expanding
————————————
xs: [[0.31768381 0.66738691 0.33324228]
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 [0.31735114 0.66657473 0.33340764]
 [0.31733881 0.66734053 0.33222822]
 [0.31709079 0.66683621 0.33305896]
 [0.31711636 0.66715228 0.3320794 ]]
fxs: [0.00024543 0.00025189 0.0002534  0.00025544 0.0002575  0.00026392
 0.0002648 ]
Centroid: [0.31736276 0.66719362 0.3329323 ]
x_new: [[0.31760916 0.66723495 0.3337852 ]]
fx_new [0.00024778]
Back to top
————————————
xs: [[0.31768381 0.66738691 0.33324228]
 [0.31760916 0.66723495 0.3337852 ]
 [0.31750095 0.66755967 0.33398773]
 [0.31745746 0.66750499 0.33252186]
 [0.31735114 0.66657473 0.33340764]
 [0.31733881 0.66734053 0.33222822]
 [0.31709079 0.66683621 0.33305896]]
fxs: [0.00024543 0.00024778 0.00025189 0.0002534  0.00025544 0.0002575
```

```
  0.00026392]
Centroid: [0.31743316 0.66720543 0.33317598]
x_new: [[0.31777553 0.66757464 0.33329301]]
fx_new [0.00024287]
Expanding
————————
xs: [[0.3181179  0.66794385 0.33341003]
 [0.31768381 0.66738691 0.33324228]
 [0.31760916 0.66723495 0.3337852 ]
 [0.31750095 0.66755967 0.33398773]
 [0.31745746 0.66750499 0.33252186]
 [0.31735114 0.66657473 0.33340764]
 [0.31733881 0.66734053 0.33222822]]
fxs: [0.00023315 0.00024543 0.00024778 0.00025189 0.0002534  0.00025544
 0.0002575 ]
Centroid: [0.31757989 0.66736366 0.33322614]
x_new: [[0.31782097 0.66738679 0.33422405]]
fx_new [0.00024195]
Back to top
————————
xs: [[0.3181179  0.66794385 0.33341003]
 [0.31782097 0.66738679 0.33422405]
 [0.31768381 0.66738691 0.33324228]
 [0.31760916 0.66723495 0.3337852 ]
 [0.31750095 0.66755967 0.33398773]
 [0.31745746 0.66750499 0.33252186]
 [0.31735114 0.66657473 0.33340764]]
fxs: [0.00023315 0.00024195 0.00024543 0.00024778 0.00025189 0.0002534
 0.00025544]
Centroid: [0.31764877 0.66737027 0.33351126]
x_new: [[0.3179464  0.66816581 0.33361487]]
fx_new [0.00023908]
Back to top
————————
xs: [[0.3181179  0.66794385 0.33341003]
 [0.3179464  0.66816581 0.33361487]
 [0.31782097 0.66738679 0.33422405]
 [0.31768381 0.66738691 0.33324228]
 [0.31760916 0.66723495 0.3337852 ]
 [0.31750095 0.66755967 0.33398773]
 [0.31745746 0.66750499 0.33252186]]
fxs: [0.00023315 0.00023908 0.00024195 0.00024543 0.00024778 0.00025189
 0.0002534 ]
Centroid: [0.31773381 0.66759756 0.33354086]
x_new: [[0.31801015 0.66769014 0.33455986]]
fx_new [0.00023735]
Back to top
————————
xs: [[0.3181179  0.66794385 0.33341003]
 [0.31801015 0.66769014 0.33455986]
 [0.3179464  0.66816581 0.33361487]
 [0.31782097 0.66738679 0.33422405]
 [0.31768381 0.66738691 0.33324228]
 [0.31760916 0.66723495 0.3337852 ]
 [0.31750095 0.66755967 0.33398773]]
fxs: [0.00023315 0.00023735 0.00023908 0.00024195 0.00024543 0.00024778
 0.00025189]
Centroid: [0.31781276 0.66762401 0.333832  ]
x_new: [[0.31812458 0.66768836 0.33367628]]
fx_new [0.00023247]
Expanding
————————
xs: [[0.3184364  0.66775271 0.33352055]
 [0.3181179  0.66794385 0.33341003]
 [0.31801015 0.66769014 0.33455986]
 [0.3179464  0.66816581 0.33361487]
 [0.31782097 0.66738679 0.33422405]
 [0.31768381 0.66738691 0.33324228]
 [0.31760916 0.66723495 0.3337852 ]]
fxs: [0.00022313 0.00023315 0.00023735 0.00023908 0.00024195 0.00024543
```

```
   0.00024778]
Centroid: [0.3179464   0.66765159 0.33376526]
x_new: [[0.31828364 0.66806824 0.33374533]]
fx_new [0.00022863]
Back to top
—————————
xs: [[0.3184364   0.66775271 0.33352055]
 [0.31828364 0.66806824 0.33374533]
 [0.3181179   0.66794385 0.33341003]
 [0.31801015 0.66769014 0.33455986]
 [0.3179464   0.66816581 0.33361487]
 [0.31782097 0.66738679 0.33422405]
 [0.31768381 0.66738691 0.33324228]]
fxs: [0.00022313 0.00022863 0.00023315 0.00023735 0.00023908 0.00024195
 0.00024543]
Centroid: [0.31804275 0.66777063 0.33375957]
x_new: [[0.31840169 0.66815436 0.33427686]]
fx_new [0.00022606]
Back to top
—————————
xs: [[0.3184364   0.66775271 0.33352055]
 [0.31840169 0.66815436 0.33427686]
 [0.31828364 0.66806824 0.33374533]
 [0.3181179   0.66794385 0.33341003]
 [0.31801015 0.66769014 0.33455986]
 [0.3179464   0.66816581 0.33361487]
 [0.31782097 0.66738679 0.33422405]]
fxs: [0.00022313 0.00022606 0.00022863 0.00023315 0.00023735 0.00023908
 0.00024195]
Centroid: [0.31814531 0.66788027 0.33390737]
x_new: [[0.31846965 0.66837375 0.33359068]]
fx_new [0.00022391]
Back to top
—————————
xs: [[0.3184364   0.66775271 0.33352055]
 [0.31846965 0.66837375 0.33359068]
 [0.31840169 0.66815436 0.33427686]
 [0.31828364 0.66806824 0.33374533]
 [0.3181179   0.66794385 0.33341003]
 [0.31801015 0.66769014 0.33455986]
 [0.3179464   0.66816581 0.33361487]]
fxs: [0.00022313 0.00022391 0.00022606 0.00022863 0.00023315 0.00023735
 0.00023908]
Centroid: [0.31823798 0.66802127 0.33381689]
x_new: [[0.31852955 0.66787673 0.3340189 ]]
fx_new [0.00022109]
Expanding
—————————
xs: [[0.31882113 0.66773218 0.33422091]
 [0.3184364   0.66775271 0.33352055]
 [0.31846965 0.66837375 0.33359068]
 [0.31840169 0.66815436 0.33427686]
 [0.31828364 0.66806824 0.33374533]
 [0.3181179   0.66794385 0.33341003]
 [0.31801015 0.66769014 0.33455986]]
fxs: [0.00021253 0.00022313 0.00022391 0.00022606 0.00022863 0.00023315
 0.00023735]
Centroid: [0.31836294 0.66795932 0.33390346]
x_new: [[0.31871572 0.6682285  0.33324706]]
fx_new [0.00021612]
Back to top
—————————
xs: [[0.31882113 0.66773218 0.33422091]
 [0.31871572 0.6682285  0.33324706]
 [0.3184364   0.66775271 0.33352055]
 [0.31846965 0.66837375 0.33359068]
 [0.31840169 0.66815436 0.33427686]
 [0.31828364 0.66806824 0.33374533]
 [0.3181179   0.66794385 0.33341003]]
fxs: [0.00021253 0.00021612 0.00022313 0.00022391 0.00022606 0.00022863
```

```
  0.00023315]
Centroid: [0.31846373 0.66803623 0.33371592]
x_new: [[0.31880956 0.66812861 0.33402181]]
fx_new [0.00021355]
Back to top
————————————
xs: [[0.31882113 0.66773218 0.33422091]
 [0.31880956 0.66812861 0.33402181]
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 [0.3184364  0.66775271 0.33352055]
 [0.31846965 0.66837375 0.33359068]
 [0.31840169 0.66815436 0.33427686]
 [0.31828364 0.66806824 0.33374533]]
fxs: [0.00021253 0.00021355 0.00021612 0.00022313 0.00022391 0.00022606
 0.00022863]
Centroid: [0.31856254 0.66806262 0.33380332]
x_new: [[0.31884144 0.66805701 0.3338613 ]]
fx_new [0.00021223]
Expanding
————————————
xs: [[0.31912034 0.6680514  0.33391928]
 [0.31882113 0.66773218 0.33422091]
 [0.31880956 0.66812861 0.33402181]
 [0.31871572 0.6682285  0.33324706]
 [0.3184364  0.66775271 0.33352055]
 [0.31846965 0.66837375 0.33359068]
 [0.31840169 0.66815436 0.33427686]]
fxs: [0.00020427 0.00021253 0.00021355 0.00021612 0.00022313 0.00022391
 0.00022606]
Centroid: [0.31868207 0.66806022 0.33382817]
x_new: [[0.31896245 0.66796607 0.33337947]]
fx_new [0.00020821]
Back to top
————————————
xs: [[0.31912034 0.6680514  0.33391928]
 [0.31896245 0.66796607 0.33337947]
 [0.31882113 0.66773218 0.33422091]
 [0.31880956 0.66812861 0.33402181]
 [0.31871572 0.6682285  0.33324706]
 [0.3184364  0.66775271 0.33352055]
 [0.31846965 0.66837375 0.33359068]]
fxs: [0.00020427 0.00020821 0.00021253 0.00021355 0.00021612 0.00022313
 0.00022391]
Centroid: [0.31876218 0.66803332 0.33369997]
x_new: [[0.31905471 0.66769288 0.33380925]]
fx_new [0.00020516]
Back to top
————————————
xs: [[0.31912034 0.6680514  0.33391928]
 [0.31905471 0.66769288 0.33380925]
 [0.31896245 0.66796607 0.33337947]
 [0.31882113 0.66773218 0.33422091]
 [0.31880956 0.66812861 0.33402181]
 [0.31871572 0.6682285  0.33324706]
 [0.3184364  0.66775271 0.33352055]]
fxs: [0.00020427 0.00020516 0.00020821 0.00021253 0.00021355 0.00021612
 0.00022313]
Centroid: [0.31884576 0.66793605 0.33373119]
x_new: [[0.31925512 0.66811939 0.33394183]]
fx_new [0.00020068]
Expanding
————————————
xs: [[0.31966448 0.66830273 0.33415246]
 [0.31912034 0.6680514  0.33391928]
 [0.31905471 0.66769288 0.33380925]
 [0.31896245 0.66796607 0.33337947]
 [0.31882113 0.66773218 0.33422091]
 [0.31880956 0.66812861 0.33402181]
 [0.31871572 0.6682285  0.33324706]]
fxs: [0.00019019 0.00020427 0.00020516 0.00020821 0.00021253 0.00021355
```

```
   0.00021612]
Centroid: [0.3190212  0.66801462 0.33382146]
x_new: [[0.31932668 0.66780075 0.33439587]]
fx_new [0.0001986]
Back to top
————————
xs: [[0.31966448 0.66830273 0.33415246]
 [0.31932668 0.66780075 0.33439587]
 [0.31912034 0.6680514  0.33391928]
 [0.31905471 0.66769288 0.33380925]
 [0.31896245 0.66796607 0.33337947]
 [0.31882113 0.66773218 0.33422091]
 [0.31880956 0.66812861 0.33402181]]
fxs: [0.00019019 0.0001986  0.00020427 0.00020516 0.00020821 0.00021253
 0.00021355]
Centroid: [0.31910848 0.66795352 0.33398558]
x_new: [[0.31940739 0.66777842 0.33394935]]
fx_new [0.00019555]
Back to top
————————
xs: [[0.31966448 0.66830273 0.33415246]
 [0.31940739 0.66777842 0.33394935]
 [0.31932668 0.66780075 0.33439587]
 [0.31912034 0.6680514  0.33391928]
 [0.31905471 0.66769288 0.33380925]
 [0.31896245 0.66796607 0.33337947]
 [0.31882113 0.66773218 0.33422091]]
fxs: [0.00019019 0.00019555 0.0001986  0.00020427 0.00020516 0.00020821
 0.00021253]
Centroid: [0.31919388 0.66790349 0.33397523]
x_new: [[0.31956664 0.6680748  0.33372954]]
fx_new [0.00019166]
Back to top
————————
xs: [[0.31966448 0.66830273 0.33415246]
 [0.31956664 0.6680748  0.33372954]
 [0.31940739 0.66777842 0.33394935]
 [0.31932668 0.66780075 0.33439587]
 [0.31912034 0.6680514  0.33391928]
 [0.31905471 0.66769288 0.33380925]
 [0.31896245 0.66796607 0.33337947]]
fxs: [0.00019019 0.00019166 0.00019555 0.0001986  0.00020427 0.00020516
 0.00020821]
Centroid: [0.31930038 0.66795243 0.33390503]
x_new: [[0.31963832 0.6679388  0.33443059]]
fx_new [0.00019038]
Back to top
————————
xs: [[0.31966448 0.66830273 0.33415246]
 [0.31963832 0.6679388  0.33443059]
 [0.31956664 0.6680748  0.33372954]
 [0.31940739 0.66777842 0.33394935]
 [0.31932668 0.66780075 0.33439587]
 [0.31912034 0.6680514  0.33391928]
 [0.31905471 0.66769288 0.33380925]]
fxs: [0.00019019 0.00019038 0.00019166 0.00019555 0.0001986  0.00020427
 0.00020516]
Centroid: [0.31939694 0.66794854 0.33405519]
x_new: [[0.31973917 0.66820419 0.33430113]]
fx_new [0.0001881]
Expanding
————————
xs: [[0.3200814  0.66845985 0.33454708]
 [0.31966448 0.66830273 0.33415246]
 [0.31963832 0.6679388  0.33443059]
 [0.31956664 0.6680748  0.33372954]
 [0.31940739 0.66777842 0.33394935]
 [0.31932668 0.66780075 0.33439587]
 [0.31912034 0.6680514  0.33391928]]
fxs: [0.0001803  0.00019019 0.00019038 0.00019166 0.00019555 0.0001986
```

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 0.00020427]
Centroid: [0.31954361 0.66805811 0.3341606 ]
x_new: [[0.31996687 0.66806482 0.33440191]]
fx_new [0.00018176]
Back to top
————————
xs: [[0.3200814  0.66845985 0.33454708]
 [0.31996687 0.66806482 0.33440191]
 [0.31966448 0.66830273 0.33415246]
 [0.31963832 0.6679388  0.33443059]
 [0.31956664 0.6680748  0.33372954]
 [0.31940739 0.66777842 0.33394935]
 [0.31932668 0.66780075 0.33439587]]
fxs: [0.0001803  0.00018176 0.00019019 0.00019038 0.00019166 0.00019555
 0.0001986 ]
Centroid: [0.31966454 0.66806002 0.33422954]
x_new: [[0.3200024  0.6683193  0.33406322]]
fx_new [0.00018098]
Back to top
————————
xs: [[0.3200814  0.66845985 0.33454708]
 [0.3200024  0.6683193  0.33406322]
 [0.31996687 0.66806482 0.33440191]
 [0.31966448 0.66830273 0.33415246]
 [0.31963832 0.6679388  0.33443059]
 [0.31956664 0.6680748  0.33372954]
 [0.31940739 0.66777842 0.33394935]]
fxs: [0.0001803  0.00018098 0.00018176 0.00019019 0.00019038 0.00019166
 0.00019555]
Centroid: [0.31976107 0.6681341  0.33418202]
x_new: [[0.32011475 0.66848978 0.3344147 ]]
fx_new [0.00017922]
Expanding
————————
xs: [[0.32046843 0.66884545 0.33464737]
 [0.3200814  0.66845985 0.33454708]
 [0.3200024  0.6683193  0.33406322]
 [0.31996687 0.66806482 0.33440191]
 [0.31966448 0.66830273 0.33415246]
 [0.31963832 0.6679388  0.33443059]
 [0.31956664 0.6680748  0.33372954]]
fxs: [0.00017198 0.0001803  0.00018098 0.00018176 0.00019019 0.00019038
 0.00019166]
Centroid: [0.31991265 0.66828653 0.33428174]
x_new: [[0.32025866 0.66849827 0.33483394]]
fx_new [0.00017655]
Back to top
————————
xs: [[0.32046843 0.66884545 0.33464737]
 [0.32025866 0.66849827 0.33483394]
 [0.3200814  0.66845985 0.33454708]
 [0.3200024  0.6683193  0.33406322]
 [0.31996687 0.66806482 0.33440191]
 [0.31966448 0.66830273 0.33415246]
 [0.31963832 0.6679388  0.33443059]]
fxs: [0.00017198 0.00017655 0.0001803  0.00018098 0.00018176 0.00019019
 0.00019038]
Centroid: [0.32001151 0.66834703 0.33443951]
x_new: [[0.3203847  0.66875526 0.33444843]]
fx_new [0.00017327]
Back to top
————————
xs: [[0.32046843 0.66884545 0.33464737]
 [0.3203847  0.66875526 0.33444843]
 [0.32025866 0.66849827 0.33483394]
 [0.3200814  0.66845985 0.33454708]
 [0.3200024  0.6683193  0.33406322]
 [0.31996687 0.66806482 0.33440191]
 [0.31966448 0.66830273 0.33415246]]
fxs: [0.00017198 0.00017327 0.00017655 0.0001803  0.00018098 0.00018176
```

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  0.00019019]
Centroid: [0.32011813 0.66846367 0.33444206]
x_new: [[0.32057179 0.66862461 0.33473165]]
fx_new [0.00016865]
Expanding
————————
xs: [[0.32102544 0.66878555 0.33502125]
 [0.32046843 0.66884545 0.33464737]
 [0.3203847  0.66875526 0.33444843]
 [0.32025866 0.66849827 0.33483394]
 [0.3200814  0.66845985 0.33454708]
 [0.3200024  0.6683193  0.33406322]
 [0.31996687 0.66806482 0.33440191]]
fxs: [0.00015882 0.00017198 0.00017327 0.00017655 0.0001803  0.00018098
 0.00018176]
Centroid: [0.32031256 0.66853264 0.33456617]
x_new: [[0.32065824 0.66900047 0.33473043]]
fx_new [0.00016806]
Back to top
————————
xs: [[0.32102544 0.66878555 0.33502125]
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 [0.32046843 0.66884545 0.33464737]
 [0.3203847  0.66875526 0.33444843]
 [0.32025866 0.66849827 0.33483394]
 [0.3200814  0.66845985 0.33454708]
 [0.3200024  0.6683193  0.33406322]]
fxs: [0.00015882 0.00016806 0.00017198 0.00017327 0.00017655 0.0001803
 0.00018098]
Centroid: [0.32041132 0.66866631 0.3346131 ]
x_new: [[0.32082024 0.66901332 0.33516298]]
fx_new [0.00016543]
Back to top
————————
xs: [[0.32102544 0.66878555 0.33502125]
 [0.32082024 0.66901332 0.33516298]
 [0.32065824 0.66900047 0.33473043]
 [0.32046843 0.66884545 0.33464737]
 [0.3203847  0.66875526 0.33444843]
 [0.32025866 0.66849827 0.33483394]
 [0.3200814  0.66845985 0.33454708]]
fxs: [0.00015882 0.00016543 0.00016806 0.00017198 0.00017327 0.00017655
 0.0001803 ]
Centroid: [0.32052816 0.66876545 0.33477021]
x_new: [[0.32097492 0.66907106 0.33499334]]
fx_new [0.00016127]
Back to top
————————
xs: [[0.32102544 0.66878555 0.33502125]
 [0.32097492 0.66907106 0.33499334]
 [0.32082024 0.66901332 0.33516298]
 [0.32065824 0.66900047 0.33473043]
 [0.32046843 0.66884545 0.33464737]
 [0.3203847  0.66875526 0.33444843]
 [0.32025866 0.66849827 0.33483394]]
fxs: [0.00015882 0.00016127 0.00016543 0.00016806 0.00017198 0.00017327
 0.00017655]
Centroid: [0.3206558  0.66885277 0.33483396]
x_new: [[0.32105295 0.66920727 0.33483398]]
fx_new [0.00015951]
Back to top
————————
xs: [[0.32102544 0.66878555 0.33502125]
 [0.32105295 0.66920727 0.33483398]
 [0.32097492 0.66907106 0.33499334]
 [0.32082024 0.66901332 0.33516298]
 [0.32065824 0.66900047 0.33473043]
 [0.32046843 0.66884545 0.33464737]
 [0.3203847  0.66875526 0.33444843]]
fxs: [0.00015882 0.00015951 0.00016127 0.00016543 0.00016806 0.00017198
```

```
 0.00017327]
Centroid: [0.32076927 0.66895406 0.33483397]
x_new: [[0.32115385 0.66915285 0.33521951]]
fx_new [0.00015808]
Expanding
————————
xs: [[0.32153843 0.66935164 0.33560505]
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 0.00017198]
Centroid: [0.32093409 0.66903925 0.3349992 ]
x_new: [[0.32139976 0.66923305 0.33535103]]
fx_new [0.00015307]
Back to top
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Centroid: [0.32106714 0.66909462 0.33509972]
x_new: [[0.32147604 0.66918878 0.33546902]]
fx_new [0.00015152]
Back to top
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Centroid: [0.32118397 0.66912152 0.33520523]
x_new: [[0.32154769 0.66922973 0.33524749]]
fx_new [0.00014913]
Expanding
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fxs: [0.00014142 0.00015149 0.00015152 0.00015307 0.00015882 0.00015951
 0.00016127]
Centroid: [0.32133985 0.6691679  0.33522334]
x_new: [[0.32170478 0.66926474 0.33545335]]
fx_new [0.00014647]
Back to top
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fxs: [0.00014142 0.00014647 0.00015149 0.00015152 0.00015307 0.00015882
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x_new: [[0.32183528 0.66918386 0.33574414]]
fx_new [0.00014435]
Back to top
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 0.00015882]
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fx_new [0.00014126]
Expanding
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fxs: [0.0001343  0.00014142 0.00014435 0.00014647 0.00015149 0.00015152
 0.00015307]
Centroid: [0.32178321 0.66936651 0.33558958]
x_new: [[0.32216666 0.66949997 0.33582814]]
fx_new [0.00013895]
Back to top
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Centroid: [0.32189277 0.66940464 0.33565774]
x_new: [[0.32230949 0.6696205  0.33584647]]
fx_new [0.00013657]
Back to top
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Centroid: [0.32201183 0.66946632 0.33571166]
x_new: [[0.32248523 0.66958099 0.33581828]]
fx_new [0.00013235]
Expanding
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xs: [[0.32295863 0.66969566 0.33592489]
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fxs: [0.00012353 0.0001343  0.00013657 0.00013895 0.00014142 0.00014435
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Centroid: [0.32221472 0.66951546 0.33575735]
x_new: [[0.32272465 0.66976618 0.33606136]]
fx_new [0.00012959]
Back to top
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xs: [[0.32295863 0.66969566 0.33592489]
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 [0.32183528 0.66918386 0.33574414]]
fxs: [0.00012353 0.00012959 0.0001343  0.00013657 0.00013895 0.00014142
 0.00014435]
Centroid: [0.32236041 0.6695871  0.33584421]
x_new: [[0.32288554 0.66999033 0.33594429]]
fx_new [0.00012702]
Back to top
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fxs: [0.00012353 0.00012702 0.00012959 0.0001343  0.00013657 0.00013895
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Centroid: [0.32251045 0.66970231 0.33587281]
x_new: [[0.32310949 0.67006668 0.33645587]]
fx_new [0.00012584]
Back to top
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fxs: [0.00012353 0.00012584 0.00012702 0.00012959 0.0001343  0.00013657
 0.00013895]
Centroid: [0.3226816  0.66980641 0.33603939]
x_new: [[0.32319655 0.67011286 0.33625065]]
fx_new [0.00012314]
Expanding
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xs: [[0.32371149 0.6704193  0.33646191]
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fxs: [0.00011645 0.00012353 0.00012584 0.00012702 0.00012959 0.0001343
 0.00013657]
Centroid: [0.32290229 0.66993775 0.33612993]
x_new: [[0.32349509 0.67025499 0.3364134 ]]
fx_new [0.00011915]
Back to top
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fxs: [0.00011645 0.00011915 0.00012353 0.00012584 0.00012702 0.00012959
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0.0001343 ]
Centroid: [0.32307167 0.67002839 0.33621092]
x_new: [[0.32352658 0.67005121 0.3362071 ]]
fx_new [0.00011589]
Expanding
————————————
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 0.00012959]
Centroid: [0.32326663 0.67003817 0.33620928]
x_new: [[0.3238086  0.67031015 0.33635721]]
fx_new [0.00011314]
Back to top
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fxs: [0.0001073  0.00011314 0.00011645 0.00011915 0.00012353 0.00012584
 0.00012702]
Centroid: [0.32342148 0.67011588 0.33625155]
x_new: [[0.32395741 0.67024143 0.33655881]]
fx_new [0.00011109]
Back to top
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fxs: [0.0001073  0.00011109 0.00011314 0.00011645 0.00011915 0.00012353
 0.00012584]
Centroid: [0.3235746  0.67015175 0.33633934]
x_new: [[0.32403971 0.67023682 0.33622281]]
fx_new [0.00010747]
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fxs: [0.0001073  0.00010747 0.00011109 0.00011314 0.00011645 0.00011915
 0.00012353]
Centroid: [0.32370749 0.67017605 0.33630604]
x_new: [[0.32445635 0.67065645 0.33668719]]
fx_new [0.00010597]
Expanding
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 [0.32349509 0.67025499 0.3364134 ]]
fxs: [9.99992473e-05 1.07303710e-04 1.07466390e-04 1.11090530e-04
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1.13139326e−04 1.16450090e−04 1.19153811e−04]
Centroid: [0.32402843 0.67038194 0.33646939]
x_new: [[0.32456176 0.67050889 0.33652538]]
fx_new [0.00010189]
Back to top
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xs: [[0.3252052  0.67113684 0.33706834]
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 1.11090530e−04 1.13139326e−04 1.16450090e−04]
Centroid: [0.32418081 0.67041821 0.33648539]
x_new: [[0.32465013 0.67041712 0.33650887]]
fx_new [9.95479386e−05]
Expanding
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xs: [[0.32511945 0.67041602 0.33653234]
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 1.07466390e−04 1.11090530e−04 1.13139326e−04]
Centroid: [0.32438195 0.67041774 0.33649545]
x_new: [[0.32495529 0.67052533 0.33663369]]
fx_new [9.59732389e−05]
Back to top
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 [0.32395741 0.67024143 0.33655881]]
fxs: [9.17592974e−05 9.59732389e−05 9.99992473e−05 1.01892273e−04
 1.07303710e−04 1.07466390e−04 1.11090530e−04]
Centroid: [0.32454576 0.67044848 0.33653495]
x_new: [[0.32513411 0.67065554 0.33651109]]
fx_new [9.32364886e−05]
Back to top
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xs: [[0.32511945 0.67041602 0.33653234]
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 [0.32398149 0.67007404 0.33620327]
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Centroid: [0.32471386 0.67050764 0.33652813]
x_new: [[0.325388   0.67077846 0.33683346]]
fx_new [9.22859643e−05]
Back to top
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xs: [[0.32511945 0.67041602 0.33653234]
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fxs: [9.17592974e−05 9.22859643e−05 9.32364886e−05 9.59732389e−05
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x_new: [[0.32583146 0.671096   0.33702747]]
fx_new [8.95437514e-05]
Expanding
————————————
xs: [[0.32675644 0.67160698 0.33743957]
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Centroid: [0.32530289 0.67080401 0.33679198]
x_new: [[0.32604403 0.67109913 0.33705858]]
fx_new [8.66582209e-05]
Back to top
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 9.32364886e-05 9.59732389e-05 9.99992473e-05]
Centroid: [0.32551465 0.67088833 0.33686815]
x_new: [[0.32582409 0.67063982 0.33666797]]
fx_new [8.32944434e-05]
Expanding
————————————
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 [0.32675644 0.67160698 0.33743957]
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 [0.32511945 0.67041602 0.33653234]
 [0.325388   0.67077846 0.33683346]
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 9.22859643e-05 9.32364886e-05 9.59732389e-05]
Centroid: [0.32564726 0.67078182 0.33678236]
x_new: [[0.32633924 0.67103832 0.33693103]]
fx_new [8.09720881e-05]
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Centroid: [0.32584497 0.67085511 0.33682483]
x_new: [[0.32655583 0.67105468 0.33713858]]
fx_new [7.96690645e-05]
Back to top
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fx_new [7.64813281e−05]
Back to top
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xs: [[0.32613353 0.6703913  0.33646778]
 [0.32670814 0.67104579 0.3369955 ]
 [0.32655583 0.67105468 0.33713858]
 [0.32633924 0.67103832 0.33693103]
 [0.32675644 0.67160698 0.33743957]
 [0.32604403 0.67109913 0.33705858]
 [0.32511945 0.67041602 0.33653234]]
fxs: [7.55348076e−05 7.64813281e−05 7.96690645e−05 8.09720881e−05
 8.45233536e−05 8.66582209e−05 9.17592974e−05]
Centroid: [0.32623667 0.67095032 0.33693762]
x_new: [[0.32735389 0.67148461 0.33734291]]
fx_new [7.50430657e−05]
Expanding
――――――――――
xs: [[0.3284711  0.6720189  0.33774819]
 [0.32613353 0.6703913  0.33646778]
 [0.32670814 0.67104579 0.3369955 ]
 [0.32655583 0.67105468 0.33713858]
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 [0.32675644 0.67160698 0.33743957]
 [0.32604403 0.67109913 0.33705858]]
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 8.09720881e−05 8.45233536e−05 8.66582209e−05]
Centroid: [0.32671547 0.6711793  0.33711132]
x_new: [[0.32738692 0.67125947 0.33716405]]
fx_new [7.11280585e−05]
Expanding
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xs: [[0.32805837 0.67133964 0.33721679]
 [0.3284711  0.6720189  0.33774819]
 [0.32613353 0.6703913  0.33646778]
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 [0.32655583 0.67105468 0.33713858]
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 [0.32675644 0.67160698 0.33743957]]
fxs: [6.47431296e−05 7.17786580e−05 7.55348076e−05 7.64813281e−05
 7.96690645e−05 8.09720881e−05 8.45233536e−05]
Centroid: [0.32700324 0.67121366 0.33713392]
x_new: [[0.32725003 0.67082034 0.33682827]]
fx_new [6.64741016e−05]
Back to top
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xs: [[0.32805837 0.67133964 0.33721679]
 [0.32725003 0.67082034 0.33682827]
 [0.3284711  0.6720189  0.33774819]
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fxs: [6.47431296e−05 6.64741016e−05 7.17786580e−05 7.55348076e−05
 7.64813281e−05 7.96690645e−05 8.09720881e−05]
Centroid: [0.32707375 0.67110128 0.33704659]
x_new: [[0.32780826 0.67116425 0.33716215]]
fx_new [6.54144875e−05]
Back to top
――――――――――
xs: [[0.32805837 0.67133964 0.33721679]
 [0.32780826 0.67116425 0.33716215]
 [0.32725003 0.67082034 0.33682827]
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 [0.32613353 0.6703913  0.33646778]
 [0.32670814 0.67104579 0.3369955 ]
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fxs: [6.47431296e−05 6.54144875e−05 6.64741016e−05 7.17786580e−05
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x_new: [[0.32801139 0.67118387 0.33702063]]
fx_new [6.23243597e−05]
Expanding
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xs: [[0.32873917 0.67124846 0.33696166]
 [0.32805837 0.67133964 0.33721679]
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 [0.32725003 0.67082034 0.33682827]
 [0.3284711  0.6720189  0.33774819]
 [0.32613353 0.6703913  0.33646778]
 [0.32670814 0.67104579 0.3369955 ]]
fxs: [5.52639447e−05 6.47431296e−05 6.54144875e−05 6.64741016e−05
 7.17786580e−05 7.55348076e−05 7.64813281e−05]
Centroid: [0.32759552 0.67114696 0.33705433]
x_new: [[0.32848289 0.67124812 0.33711317]]
fx_new [5.88036565e−05]
Back to top
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xs: [[0.32873917 0.67124846 0.33696166]
 [0.32848289 0.67124812 0.33711317]
 [0.32805837 0.67133964 0.33721679]
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 [0.32725003 0.67082034 0.33682827]
 [0.3284711  0.6720189  0.33774819]
 [0.32613353 0.6703913  0.33646778]]
fxs: [5.52639447e−05 5.88036565e−05 6.47431296e−05 6.54144875e−05
 6.64741016e−05 7.17786580e−05 7.55348076e−05]
Centroid: [0.32784905 0.67117586 0.33707114]
x_new: [[0.32956457 0.67196042 0.33767451]]
fx_new [6.10731376e−05]
Back to top
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xs: [[0.32873917 0.67124846 0.33696166]
 [0.32848289 0.67124812 0.33711317]
 [0.32956457 0.67196042 0.33767451]
 [0.32805837 0.67133964 0.33721679]
 [0.32780826 0.67116425 0.33716215]
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fxs: [5.52639447e−05 5.88036565e−05 6.10731376e−05 6.47431296e−05
 6.54144875e−05 6.64741016e−05 7.17786580e−05]
Centroid: [0.3283392  0.67140002 0.33724353]
x_new: [[0.32820729 0.67078113 0.33673888]]
fx_new [5.48028194e−05]
Expanding
————————
xs: [[0.32807539 0.67016225 0.33623422]
 [0.32873917 0.67124846 0.33696166]
 [0.32848289 0.67124812 0.33711317]
 [0.32956457 0.67196042 0.33767451]
 [0.32805837 0.67133964 0.33721679]
 [0.32780826 0.67116425 0.33716215]
 [0.32725003 0.67082034 0.33682827]]
fxs: [4.82801903e−05 5.52639447e−05 5.88036565e−05 6.10731376e−05
 6.47431296e−05 6.54144875e−05 6.64741016e−05]
Centroid: [0.32828267 0.67113478 0.33702725]
x_new: [[0.32931531 0.67144922 0.33722624]]
fx_new [5.41720894e−05]
Back to top
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xs: [[0.32807539 0.67016225 0.33623422]
 [0.32931531 0.67144922 0.33722624]
 [0.32873917 0.67124846 0.33696166]
 [0.32848289 0.67124812 0.33711317]
 [0.32956457 0.67196042 0.33767451]
 [0.32805837 0.67133964 0.33721679]
 [0.32780826 0.67116425 0.33716215]]
fxs: [4.82801903e−05 5.41720894e−05 5.52639447e−05 5.88036565e−05
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6143   6.10731376e-05 6.47431296e-05 6.54144875e-05]
6144  Centroid: [0.32857771 0.67122462 0.3370841 ]
6145  x_new: [[0.32934715 0.671285   0.33700606]]
6146  fx_new [5.07074923e-05]
6147  Back to top
6148  ————————————
6149  xs: [[0.32807539 0.67016225 0.33623422]
6150   [0.32934715 0.671285   0.33700606]
6151   [0.32931531 0.67144922 0.33722624]
6152   [0.32873917 0.67124846 0.33696166]
6153   [0.32848289 0.67124812 0.33711317]
6154   [0.32956457 0.67196042 0.33767451]
6155   [0.32805837 0.67133964 0.33721679]]
6156  fxs: [4.82801903e-05 5.07074923e-05 5.41720894e-05 5.52639447e-05
6157   5.88036565e-05 6.10731376e-05 6.47431296e-05]
6158  Centroid: [0.32879755 0.67124187 0.33706181]
6159  x_new: [[0.32953673 0.6711441  0.33690682]]
6160  fx_new [4.72314662e-05]
6161  Expanding
6162  ————————————
6163  xs: [[0.33027591 0.67104633 0.33675184]
6164   [0.32807539 0.67016225 0.33623422]
6165   [0.32934715 0.671285   0.33700606]
6166   [0.32931531 0.67144922 0.33722624]
6167   [0.32873917 0.67124846 0.33696166]
6168   [0.32848289 0.67124812 0.33711317]
6169   [0.32956457 0.67196042 0.33767451]]
6170  fxs: [4.02155280e-05 4.82801903e-05 5.07074923e-05 5.41720894e-05
6171   5.52639447e-05 5.88036565e-05 6.10731376e-05]
6172  Centroid: [0.32911434 0.67119997 0.33699539]
6173  x_new: [[0.32866411 0.67043952 0.33631626]]
6174  fx_new [4.49339635e-05]
6175  Back to top
6176  ————————————
6177  xs: [[0.33027591 0.67104633 0.33675184]
6178   [0.32866411 0.67043952 0.33631626]
6179   [0.32807539 0.67016225 0.33623422]
6180   [0.32934715 0.671285   0.33700606]
6181   [0.32931531 0.67144922 0.33722624]
6182   [0.32873917 0.67124846 0.33696166]
6183   [0.32848289 0.67124812 0.33711317]]
6184  fxs: [4.02155280e-05 4.49339635e-05 4.82801903e-05 5.07074923e-05
6185   5.41720894e-05 5.52639447e-05 5.88036565e-05]
6186  Centroid: [0.3289857  0.6709827  0.33680135]
6187  x_new: [[0.32948852 0.67071728 0.33648953]]
6188  fx_new [4.11516748e-05]
6189  Back to top
6190  ————————————
6191  xs: [[0.33027591 0.67104633 0.33675184]
6192   [0.32948852 0.67071728 0.33648953]
6193   [0.32866411 0.67043952 0.33631626]
6194   [0.32807539 0.67016225 0.33623422]
6195   [0.32934715 0.671285   0.33700606]
6196   [0.32931531 0.67144922 0.33722624]
6197   [0.32873917 0.67124846 0.33696166]]
6198  fxs: [4.02155280e-05 4.11516748e-05 4.49339635e-05 4.82801903e-05
6199   5.07074923e-05 5.41720894e-05 5.52639447e-05]
6200  Centroid: [0.32912937 0.67090687 0.33671226]
6201  x_new: [[0.32951956 0.67056527 0.33646286]]
6202  fx_new [3.95378983e-05]
6203  Expanding
6204  ————————————
6205  xs: [[0.32990976 0.67022368 0.33621346]
6206   [0.33027591 0.67104633 0.33675184]
6207   [0.32948852 0.67071728 0.33648953]
6208   [0.32866411 0.67043952 0.33631626]
6209   [0.32807539 0.67016225 0.33623422]
6210   [0.32934715 0.671285   0.33700606]
6211   [0.32931531 0.67144922 0.33722624]]
6212  fxs: [3.26682987e-05 4.02155280e-05 4.11516748e-05 4.49339635e-05
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   4.82801903e−05 5.07074923e−05 5.41720894e−05]
Centroid: [0.32929659 0.67076047 0.33660537]
x_new: [[0.32927788 0.67007171 0.33598451]]
fx_new [3.50697921e−05]
Back to top
————————
xs: [[0.32990976 0.67022368 0.33621346]
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 [0.33027591 0.67104633 0.33675184]
 [0.32948852 0.67071728 0.33648953]
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 [0.32807539 0.67016225 0.33623422]
 [0.32934715 0.671285   0.33700606]]
fxs: [3.26682987e−05 3.50697921e−05 4.02155280e−05 4.11516748e−05
 4.49339635e−05 4.82801903e−05 5.07074923e−05]
Centroid: [0.32929125 0.67056368 0.33642798]
x_new: [[0.32923534 0.66984237 0.33584991]]
fx_new [3.32117985e−05]
Back to top
————————
xs: [[0.32990976 0.67022368 0.33621346]
 [0.32923534 0.66984237 0.33584991]
 [0.32927788 0.67007171 0.33598451]
 [0.33027591 0.67104633 0.33675184]
 [0.32948852 0.67071728 0.33648953]
 [0.32866411 0.67043952 0.33631626]
 [0.32807539 0.67016225 0.33623422]]
fxs: [3.26682987e−05 3.32117985e−05 3.50697921e−05 4.02155280e−05
 4.11516748e−05 4.49339635e−05 4.82801903e−05]
Centroid: [0.32927527 0.67035759 0.33626282]
x_new: [[0.33047515 0.67055294 0.33629142]]
fx_new [3.20225578e−05]
Expanding
————————
xs: [[0.33167504 0.67074828 0.33632002]
 [0.32990976 0.67022368 0.33621346]
 [0.32923534 0.66984237 0.33584991]
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 [0.33027591 0.67104633 0.33675184]
 [0.32948852 0.67071728 0.33648953]
 [0.32866411 0.67043952 0.33631626]]
fxs: [2.83298273e−05 3.26682987e−05 3.32117985e−05 3.50697921e−05
 4.02155280e−05 4.11516748e−05 4.49339635e−05]
Centroid: [0.32978951 0.67044131 0.33627508]
x_new: [[0.3309149  0.6704431  0.33623389]]
fx_new [2.8523465e−05]
Back to top
————————
xs: [[0.33167504 0.67074828 0.33632002]
 [0.3309149  0.6704431  0.33623389]
 [0.32990976 0.67022368 0.33621346]
 [0.32923534 0.66984237 0.33584991]
 [0.32927788 0.67007171 0.33598451]
 [0.33027591 0.67104633 0.33675184]
 [0.32948852 0.67071728 0.33648953]]
fxs: [2.83298273e−05 2.85234650e−05 3.26682987e−05 3.32117985e−05
 3.50697921e−05 4.02155280e−05 4.11516748e−05]
Centroid: [0.33011105 0.67044182 0.33626331]
x_new: [[0.33073358 0.67016636 0.33603708]]
fx_new [2.631686e−05]
Expanding
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xs: [[0.33135611 0.6698909  0.33581086]
 [0.33167504 0.67074828 0.33632002]
 [0.3309149  0.6704431  0.33623389]
 [0.32990976 0.67022368 0.33621346]
 [0.32923534 0.66984237 0.33584991]
 [0.32927788 0.67007171 0.33598451]
 [0.33027591 0.67104633 0.33675184]]
fxs: [2.04432496e−05 2.83298273e−05 2.85234650e−05 3.26682987e−05
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Centroid: [0.33037785 0.67032377 0.33616635]
x_new: [[0.33047979 0.6696012  0.33558086]]
fx_new [2.18056436e−05]
Back to top
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xs: [[0.33135611 0.6698909   0.33581086]
 [0.33047979 0.6696012   0.33558086]
 [0.33167504 0.67074828 0.33632002]
 [0.3309149  0.6704431   0.33623389]
 [0.32990976 0.67022368 0.33621346]
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 [0.32927788 0.67007171 0.33598451]]
fxs: [2.04432496e−05 2.18056436e−05 2.83298273e−05 2.85234650e−05
 3.26682987e−05 3.32117985e−05 3.50697921e−05]
Centroid: [0.33040697 0.67011732 0.33599907]
x_new: [[0.33153607 0.67016293 0.33601364]]
fx_new [2.26380325e−05]
Back to top
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xs: [[0.33135611 0.6698909   0.33581086]
 [0.33047979 0.6696012   0.33558086]
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fxs: [2.04432496e−05 2.18056436e−05 2.26380325e−05 2.83298273e−05
 2.85234650e−05 3.26682987e−05 3.32117985e−05]
Centroid: [0.33072957 0.67013035 0.33600323]
x_new: [[0.3322238  0.67041834 0.33615656]]
fx_new [2.32766693e−05]
Back to top
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xs: [[0.33135611 0.6698909   0.33581086]
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fxs: [2.04432496e−05 2.18056436e−05 2.26380325e−05 2.32766693e−05
 2.83298273e−05 2.85234650e−05 3.26682987e−05]
Centroid: [0.33115649 0.67021263 0.33604704]
x_new: [[0.33240323 0.67020159 0.33588062]]
fx_new [1.98494505e−05]
Expanding
————————
xs: [[0.33364997 0.67019054 0.33571421]
 [0.33135611 0.6698909   0.33581086]
 [0.33047979 0.6696012   0.33558086]
 [0.33153607 0.67016293 0.33601364]
 [0.3322238  0.67041834 0.33615656]
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 [0.3309149  0.6704431   0.33623389]]
fxs: [1.81865307e−05 2.04432496e−05 2.18056436e−05 2.26380325e−05
 2.32766693e−05 2.83298273e−05 2.85234650e−05]
Centroid: [0.33169081 0.6702079  0.33597572]
x_new: [[0.33246672 0.6699727  0.33571755]]
fx_new [1.73653644e−05]
Expanding
————————
xs: [[0.33324262 0.6697375   0.33545938]
 [0.33364997 0.67019054 0.33571421]
 [0.33135611 0.6698909   0.33581086]
 [0.33047979 0.6696012   0.33558086]
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 [0.3322238  0.67041834 0.33615656]
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fxs: [1.39583200e−05 1.81865307e−05 2.04432496e−05 2.18056436e−05
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   2.26380325e−05 2.32766693e−05 2.83298273e−05]
Centroid: [0.33202334 0.6701071  0.33586507]
x_new: [[0.33237165 0.66946592 0.33541013]]
fx_new [1.30737279e−05]
Expanding
————————————
xs: [[0.33271995 0.66882473 0.33495519]
 [0.33324262 0.6697375  0.33545938]
 [0.33364997 0.67019054 0.33571421]
 [0.33135611 0.6698909  0.33581086]
 [0.33047979 0.6696012  0.33558086]
 [0.33153607 0.67016293 0.33601364]
 [0.3322238  0.67041834 0.33615656]]
fxs: [7.66389774e−06 1.39583200e−05 1.81865307e−05 2.04432496e−05
 2.18056436e−05 2.26380325e−05 2.32766693e−05]
Centroid: [0.33217262 0.66983231 0.3356701 ]
x_new: [[0.33212143 0.66924628 0.33518364]]
fx_new [1.15467471e−05]
Back to top
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xs: [[0.33271995 0.66882473 0.33495519]
 [0.33212143 0.66924628 0.33518364]
 [0.33324262 0.6697375  0.33545938]
 [0.33364997 0.67019054 0.33571421]
 [0.33135611 0.6698909  0.33581086]
 [0.33047979 0.6696012  0.33558086]
 [0.33153607 0.67016293 0.33601364]]
fxs: [7.66389774e−06 1.15467471e−05 1.39583200e−05 1.81865307e−05
 2.04432496e−05 2.18056436e−05 2.26380325e−05]
Centroid: [0.33215799 0.66966487 0.33553111]
x_new: [[0.33277991 0.66916681 0.33504859]]
fx_new [9.49908947e−06]
Back to top
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 [0.33212143 0.66924628 0.33518364]
 [0.33324262 0.6697375  0.33545938]
 [0.33364997 0.67019054 0.33571421]
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 [0.33047979 0.6696012  0.33558086]]
fxs: [7.66389774e−06 9.49908947e−06 1.15467471e−05 1.39583200e−05
 1.81865307e−05 2.04432496e−05 2.18056436e−05]
Centroid: [0.33233568 0.66952257 0.33539325]
x_new: [[0.33419158 0.66944393 0.33520563]]
fx_new [1.1955273e−05]
Back to top
————————————
xs: [[0.33271995 0.66882473 0.33495519]
 [0.33277991 0.66916681 0.33504859]
 [0.33212143 0.66924628 0.33518364]
 [0.33419158 0.66944393 0.33520563]
 [0.33324262 0.6697375  0.33545938]
 [0.33364997 0.67019054 0.33571421]
 [0.33135611 0.6698909  0.33581086]]
fxs: [7.66389774e−06 9.49908947e−06 1.15467471e−05 1.19552730e−05
 1.39583200e−05 1.81865307e−05 2.04432496e−05]
Centroid: [0.33286594 0.6695001  0.33533964]
x_new: [[0.33437577 0.6691093  0.33486842]]
fx_new [9.40962149e−06]
Back to top
————————————
xs: [[0.33271995 0.66882473 0.33495519]
 [0.33437577 0.6691093  0.33486842]
 [0.33277991 0.66916681 0.33504859]
 [0.33212143 0.66924628 0.33518364]
 [0.33419158 0.66944393 0.33520563]
 [0.33324262 0.6697375  0.33545938]
 [0.33364997 0.67019054 0.33571421]]
fxs: [7.66389774e−06 9.40962149e−06 9.49908947e−06 1.15467471e−05
```

```
  1.19552730e-05  1.39583200e-05  1.81865307e-05]
Centroid:  [0.33329732  0.66938844  0.33520501]
x_new:  [[0.33294467  0.66858634  0.33469581]]
fx_new  [5.6925415e-06]
Expanding
——————————
xs:  [[0.33259202  0.66778424  0.33418661]
 [0.33271995  0.66882473  0.33495519]
 [0.33437577  0.6691093   0.33486842]
 [0.33277991  0.66916681  0.33504859]
 [0.33212143  0.66924628  0.33518364]
 [0.33419158  0.66944393  0.33520563]
 [0.33324262  0.6697375   0.33545938]]
fxs:  [2.52658476e-06  7.66389774e-06  9.40962149e-06  9.49908947e-06
 1.15467471e-05  1.19552730e-05  1.39583200e-05]
Centroid:  [0.33314618  0.66904468  0.33498678]
x_new:  [[0.33304975  0.66835187  0.33451418]]
fx_new  [4.3147219e-06]
Back to top
——————————
xs:  [[0.33259202  0.66778424  0.33418661]
 [0.33304975  0.66835187  0.33451418]
 [0.33271995  0.66882473  0.33495519]
 [0.33437577  0.6691093   0.33486842]
 [0.33277991  0.66916681  0.33504859]
 [0.33212143  0.66924628  0.33518364]
 [0.33419158  0.66944393  0.33520563]]
fxs:  [2.52658476e-06  4.31472190e-06  7.66389774e-06  9.40962149e-06
 9.49908947e-06  1.15467471e-05  1.19552730e-05]
Centroid:  [0.33311863  0.66884674  0.33485175]
x_new:  [[0.33204568  0.66824954  0.33449787]]
fx_new  [5.51969692e-06]
Back to top
——————————
xs:  [[0.33259202  0.66778424  0.33418661]
 [0.33304975  0.66835187  0.33451418]
 [0.33204568  0.66824954  0.33449787]
 [0.33271995  0.66882473  0.33495519]
 [0.33437577  0.6691093   0.33486842]
 [0.33277991  0.66916681  0.33504859]
 [0.33212143  0.66924628  0.33518364]]
fxs:  [2.52658476e-06  4.31472190e-06  5.51969692e-06  7.66389774e-06
 9.40962149e-06  9.49908947e-06  1.15467471e-05]
Centroid:  [0.33281207  0.66867611  0.33475064]
x_new:  [[0.33350272  0.66810594  0.33431765]]
fx_new  [3.06907293e-06]
Back to top
——————————
xs:  [[0.33259202  0.66778424  0.33418661]
 [0.33350272  0.66810594  0.33431765]
 [0.33304975  0.66835187  0.33451418]
 [0.33204568  0.66824954  0.33449787]
 [0.33271995  0.66882473  0.33495519]
 [0.33437577  0.6691093   0.33486842]
 [0.33277991  0.66916681  0.33504859]]
fxs:  [2.52658476e-06  3.06907293e-06  4.31472190e-06  5.51969692e-06
 7.66389774e-06  9.40962149e-06  9.49908947e-06]
Centroid:  [0.3330094   0.6685132   0.33462693]
x_new:  [[0.33323889  0.6678596   0.33420527]]
fx_new  [2.1922808e-06]
Expanding
——————————
xs:  [[0.33346837  0.66720599  0.33378362]
 [0.33259202  0.66778424  0.33418661]
 [0.33350272  0.66810594  0.33431765]
 [0.33304975  0.66835187  0.33451418]
 [0.33204568  0.66824954  0.33449787]
 [0.33271995  0.66882473  0.33495519]
 [0.33437577  0.6691093   0.33486842]]
fxs:  [5.11860052e-07  2.52658476e-06  3.06907293e-06  4.31472190e-06
```

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```
5.51969692e−06 7.66389774e−06 9.40962149e−06]
Centroid: [0.33310775 0.66823309 0.33444622]
x_new: [[0.33183973 0.66735687 0.33402402]]
fx_new [3.18426791e−06]
Back to top
————————————
xs: [[0.33346837 0.66720599 0.33378362]
 [0.33259202 0.66778424 0.33418661]
 [0.33350272 0.66810594 0.33431765]
 [0.33183973 0.66735687 0.33402402]
 [0.33304975 0.66835187 0.33451418]
 [0.33204568 0.66824954 0.33449787]
 [0.33271995 0.66882473 0.33495519]]
fxs: [5.11860052e−07 2.52658476e−06 3.06907293e−06 3.18426791e−06
 4.31472190e−06 5.51969692e−06 7.66389774e−06]
Centroid: [0.33274546 0.66798274 0.33432559]
x_new: [[0.33277097 0.66714075 0.33369599]]
fx_new [6.72527158e−07]
Back to top
————————————
xs: [[0.33346837 0.66720599 0.33378362]
 [0.33277097 0.66714075 0.33369599]
 [0.33259202 0.66778424 0.33418661]
 [0.33350272 0.66810594 0.33431765]
 [0.33183973 0.66735687 0.33402402]
 [0.33304975 0.66835187 0.33451418]
 [0.33204568 0.66824954 0.33449787]]
fxs: [5.11860052e−07 6.72527158e−07 2.52658476e−06 3.06907293e−06
 3.18426791e−06 4.31472190e−06 5.51969692e−06]
Centroid: [0.33275275 0.66774217 0.33414571]
x_new: [[0.33345982 0.6672348  0.33379354]]
fx_new [5.50561988e−07]
Back to top
————————————
xs: [[0.33346837 0.66720599 0.33378362]
 [0.33345982 0.6672348  0.33379354]
 [0.33277097 0.66714075 0.33369599]
 [0.33259202 0.66778424 0.33418661]
 [0.33350272 0.66810594 0.33431765]
 [0.33183973 0.66735687 0.33402402]
 [0.33304975 0.66835187 0.33451418]]
fxs: [5.11860052e−07 5.50561988e−07 6.72527158e−07 2.52658476e−06
 3.06907293e−06 3.18426791e−06 4.31472190e−06]
Centroid: [0.33295477 0.66759721 0.33404509]
x_new: [[0.33285979 0.66684255 0.33357599]]
fx_new [3.14057014e−07]
Expanding
————————————
xs: [[0.33285979 0.66684255 0.33357599]
 [0.33346837 0.66720599 0.33378362]
 [0.33345982 0.6672348  0.33379354]
 [0.33277097 0.66714075 0.33369599]
 [0.33259202 0.66778424 0.33418661]
 [0.33350272 0.66810594 0.33431765]
 [0.33183973 0.66735687 0.33402402]]
fxs: [3.14057014e−07 5.11860052e−07 5.50561988e−07 6.72527158e−07
 2.52658476e−06 3.06907293e−06 3.18426791e−06]
Centroid: [0.33292763 0.66738159 0.33391106]
x_new: [[0.33401553 0.66740631 0.3337981 ]]
fx_new [1.2284729e−06]
Back to top
————————————
xs: [[0.33285979 0.66684255 0.33357599]
 [0.33346837 0.66720599 0.33378362]
 [0.33345982 0.6672348  0.33379354]
 [0.33277097 0.66714075 0.33369599]
 [0.33401553 0.66740631 0.3337981 ]
 [0.33259202 0.66778424 0.33418661]
 [0.33350272 0.66810594 0.33431765]]
fxs: [3.14057014e−07 5.11860052e−07 5.50561988e−07 6.72527158e−07
```

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     1.22847290e−06 2.52658476e−06 3.06907293e−06]
Centroid: [0.33323846 0.66738865 0.33387879]
x_new: [[0.3329742  0.66667137 0.33343992]]
fx_new [1.4035733e−07]
Expanding
————————————
xs: [[0.3329742  0.66667137 0.33343992]
 [0.33285979 0.66684255 0.33357599]
 [0.33346837 0.66720599 0.33378362]
 [0.33345982 0.6672348  0.33379354]
 [0.33277097 0.66714075 0.33369599]
 [0.33401553 0.66740631 0.3337981 ]
 [0.33259202 0.66778424 0.33418661]]
fxs: [1.40357330e−07 3.14057014e−07 5.11860052e−07 5.50561988e−07
 6.72527158e−07 1.22847290e−06 2.52658476e−06]
Centroid: [0.33316296 0.66718371 0.3337534 ]
x_new: [[0.3337339  0.66658319 0.33332018]]
fx_new [1.67591559e−07]
Back to top
————————————
xs: [[0.3329742  0.66667137 0.33343992]
 [0.3337339  0.66658319 0.33332018]
 [0.33285979 0.66684255 0.33357599]
 [0.33346837 0.66720599 0.33378362]
 [0.33345982 0.6672348  0.33379354]
 [0.33277097 0.66714075 0.33369599]
 [0.33401553 0.66740631 0.3337981 ]]
fxs: [1.40357330e−07 1.67591559e−07 3.14057014e−07 5.11860052e−07
 5.50561988e−07 6.72527158e−07 1.22847290e−06]
Centroid: [0.33332608 0.66701214 0.33362962]
x_new: [[0.33263664 0.66661796 0.33346114]]
fx_new [5.04093677e−07]
Back to top
————————————
xs: [[0.3329742  0.66667137 0.33343992]
 [0.3337339  0.66658319 0.33332018]
 [0.33285979 0.66684255 0.33357599]
 [0.33263664 0.66661796 0.33346114]
 [0.33346837 0.66720599 0.33378362]
 [0.33345982 0.6672348  0.33379354]
 [0.33277097 0.66714075 0.33369599]]
fxs: [1.40357330e−07 1.67591559e−07 3.14057014e−07 5.04093677e−07
 5.11860052e−07 5.50561988e−07 6.72527158e−07]
Centroid: [0.3331291  0.66689952 0.33358148]
x_new: [[0.33348723 0.66665828 0.33346697]]
fx_new [4.16139147e−08]
Expanding
————————————
xs: [[0.33348723 0.66665828 0.33346697]
 [0.3329742  0.66667137 0.33343992]
 [0.3337339  0.66658319 0.33332018]
 [0.33285979 0.66684255 0.33357599]
 [0.33263664 0.66661796 0.33346114]
 [0.33346837 0.66720599 0.33378362]
 [0.33345982 0.6672348  0.33379354]]
fxs: [4.16139147e−08 1.40357330e−07 1.67591559e−07 3.14057014e−07
 5.04093677e−07 5.11860052e−07 5.50561988e−07]
Centroid: [0.33323142 0.66683059 0.33354877]
x_new: [[0.33300302 0.66642638 0.333304  ]]
fx_new [1.67701013e−07]
Back to top
————————————
xs: [[0.33348723 0.66665828 0.33346697]
 [0.3329742  0.66667137 0.33343992]
 [0.3337339  0.66658319 0.33332018]
 [0.33300302 0.66642638 0.333304  ]
 [0.33285979 0.66684255 0.33357599]
 [0.33263664 0.66661796 0.33346114]
 [0.33346837 0.66720599 0.33378362]]
fxs: [4.16139147e−08 1.40357330e−07 1.67591559e−07 1.67701013e−07
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   3.14057014e−07 5.04093677e−07 5.11860052e−07]
Centroid: [0.33316617 0.6667151  0.33347883]
x_new: [[0.33286396 0.66622422 0.33317405]]
fx_new [4.41448043e−07]
Back to top
————————
xs: [[0.33348723 0.66665828 0.33346697]
 [0.3329742  0.66667137 0.33343992]
 [0.3337339  0.66658319 0.33332018]
 [0.33300302 0.66642638 0.333304  ]
 [0.33285979 0.66684255 0.33357599]
 [0.33286396 0.66622422 0.33317405]
 [0.33263664 0.66661796 0.33346114]]
fxs: [4.16139147e−08 1.40357330e−07 1.67591559e−07 1.67701013e−07
 3.14057014e−07 4.41448043e−07 5.04093677e−07]
Centroid: [0.33307982 0.66657485 0.33339175]
x_new: [[0.333523   0.66653174 0.33332236]]
fx_new [5.43012118e−08]
Back to top
————————
xs: [[0.33348723 0.66665828 0.33346697]
 [0.333523   0.66653174 0.33332236]
 [0.3329742  0.66667137 0.33343992]
 [0.3337339  0.66658319 0.33332018]
 [0.33300302 0.66642638 0.333304  ]
 [0.33285979 0.66684255 0.33357599]
 [0.33286396 0.66622422 0.33317405]]
fxs: [4.16139147e−08 5.43012118e−08 1.40357330e−07 1.67591559e−07
 1.67701013e−07 3.14057014e−07 4.41448043e−07]
Centroid: [0.33320644 0.66656253 0.33337192]
x_new: [[0.33354893 0.66690085 0.3335698 ]]
fx_new [1.57240601e−07]
Back to top
————————
xs: [[0.33348723 0.66665828 0.33346697]
 [0.333523   0.66653174 0.33332236]
 [0.3329742  0.66667137 0.33343992]
 [0.33354893 0.66690085 0.3335698 ]
 [0.3337339  0.66658319 0.33332018]
 [0.33300302 0.66642638 0.333304  ]
 [0.33285979 0.66684255 0.33357599]]
fxs: [4.16139147e−08 5.43012118e−08 1.40357330e−07 1.57240601e−07
 1.67591559e−07 1.67701013e−07 3.14057014e−07]
Centroid: [0.3333043  0.66665919 0.33342846]
x_new: [[0.3337488  0.66647584 0.33328093]]
fx_new [2.11774842e−07]
Back to top
————————
xs: [[0.33348723 0.66665828 0.33346697]
 [0.333523   0.66653174 0.33332236]
 [0.3329742  0.66667137 0.33343992]
 [0.33354893 0.66690085 0.3335698 ]
 [0.3337339  0.66658319 0.33332018]
 [0.33300302 0.66642638 0.333304  ]
 [0.3337488  0.66647584 0.33328093]]
fxs: [4.16139147e−08 5.43012118e−08 1.40357330e−07 1.57240601e−07
 1.67591559e−07 1.67701013e−07 2.11774842e−07]
Centroid: [0.3334313  0.66660681 0.33338631]
x_new: [[0.3331138  0.66673777 0.33349169]]
fx_new [7.83293647e−08]
Back to top
————————
xs: [[0.33348723 0.66665828 0.33346697]
 [0.333523   0.66653174 0.33332236]
 [0.3331138  0.66673777 0.33349169]
 [0.3329742  0.66667137 0.33343992]
 [0.33354893 0.66690085 0.3335698 ]
 [0.3337339  0.66658319 0.33332018]
 [0.33300302 0.66642638 0.333304  ]]
fxs: [4.16139147e−08 5.43012118e−08 7.83293647e−08 1.40357330e−07
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   1.57240601e-07 1.67591559e-07 1.67701013e-07]]
Centroid: [0.33334058 0.66664423 0.33341642]
x_new: [[0.33367814 0.66686207 0.33352884]]
fx_new [1.95298084e-07]
Contracting
————————————
xs: [[0.33323932 0.66657887 0.33338269]
 [0.33348723 0.66665828 0.33346697]
 [0.333523   0.66653174 0.33332236]
 [0.3331138  0.66673777 0.33349169]
 [0.3329742  0.66667137 0.33343992]
 [0.33354893 0.66690085 0.3335698 ]
 [0.3337339  0.66658319 0.33332018]]
fxs: [1.89833466e-08 4.16139147e-08 5.43012118e-08 7.83293647e-08
 1.40357330e-07 1.57240601e-07 1.67591559e-07]
Centroid: [0.33337434 0.66666601 0.33342766]
x_new: [[0.33301478 0.66674883 0.33353514]]
fx_new [1.48950874e-07]
Back to top
————————————
xs: [[0.33323932 0.66657887 0.33338269]
 [0.33348723 0.66665828 0.33346697]
 [0.333523   0.66653174 0.33332236]
 [0.3331138  0.66673777 0.33349169]
 [0.3329742  0.66667137 0.33343992]
 [0.33301478 0.66674883 0.33353514]
 [0.33354893 0.66690085 0.3335698 ]]
fxs: [1.89833466e-08 4.16139147e-08 5.43012118e-08 7.83293647e-08
 1.40357330e-07 1.48950874e-07 1.57240601e-07]
Centroid: [0.33327161 0.66668967 0.33345837]
x_new: [[0.33299429 0.6664785  0.33334693]]
fx_new [1.50545272e-07]
Back to top
————————————
xs: [[0.33323932 0.66657887 0.33338269]
 [0.33348723 0.66665828 0.33346697]
 [0.333523   0.66653174 0.33332236]
 [0.3331138  0.66673777 0.33349169]
 [0.3329742  0.66667137 0.33343992]
 [0.33301478 0.66674883 0.33353514]
 [0.33299429 0.6664785  0.33334693]]
fxs: [1.89833466e-08 4.16139147e-08 5.43012118e-08 7.83293647e-08
 1.40357330e-07 1.48950874e-07 1.50545272e-07]
Centroid: [0.33319237 0.66662934 0.33342653]
x_new: [[0.33339046 0.66678018 0.33350613]]
fx_new [4.60052921e-08]
Back to top
————————————
xs: [[0.33323932 0.66657887 0.33338269]
 [0.33348723 0.66665828 0.33346697]
 [0.33339046 0.66678018 0.33350613]
 [0.333523   0.66653174 0.33332236]
 [0.3331138  0.66673777 0.33349169]
 [0.3329742  0.66667137 0.33343992]
 [0.33301478 0.66674883 0.33353514]]
fxs: [1.89833466e-08 4.16139147e-08 4.60052921e-08 5.43012118e-08
 7.83293647e-08 1.40357330e-07 1.48950874e-07]
Centroid: [0.33324897 0.66667243 0.33344927]
x_new: [[0.33348316 0.66659604 0.3333634 ]]
fx_new [2.8339988e-08]
Back to top
————————————
xs: [[0.33323932 0.66657887 0.33338269]
 [0.33348316 0.66659604 0.3333634 ]
 [0.33348723 0.66665828 0.33346697]
 [0.33339046 0.66678018 0.33350613]
 [0.333523   0.66653174 0.33332236]
 [0.3331138  0.66673777 0.33349169]
 [0.3329742  0.66667137 0.33343992]]
fxs: [1.89833466e-08 2.83399880e-08 4.16139147e-08 4.60052921e-08
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 5.43012118e−08 7.83293647e−08 1.40357330e−07]
Centroid: [0.33331588 0.66665061 0.33342474]
x_new: [[0.33365756 0.66662985 0.33340955]]
fx_new [1.12286639e−07]
Back to top
————————
xs: [[0.33323932 0.66657887 0.33338269]
 [0.33348316 0.66659604 0.3333634 ]
 [0.33348723 0.66665828 0.33346697]
 [0.33339046 0.66678018 0.33350613]
 [0.333523   0.66653174 0.33332236]
 [0.3331138  0.66673777 0.33349169]
 [0.33365756 0.66662985 0.33340955]]
fxs: [1.89833466e−08 2.83399880e−08 4.16139147e−08 4.60052921e−08
 5.43012118e−08 7.83293647e−08 1.12286639e−07]
Centroid: [0.3334135  0.66664468 0.3334204 ]
x_new: [[0.33316945 0.6666595  0.33343125]]
fx_new [3.64966848e−08]
Back to top
————————
xs: [[0.33323932 0.66657887 0.33338269]
 [0.33348316 0.66659604 0.3333634 ]
 [0.33316945 0.6666595  0.33343125]
 [0.33348723 0.66665828 0.33346697]
 [0.33339046 0.66678018 0.33350613]
 [0.333523   0.66653174 0.33332236]
 [0.3331138  0.66673777 0.33349169]]
fxs: [1.89833466e−08 2.83399880e−08 3.64966848e−08 4.16139147e−08
 4.60052921e−08 5.43012118e−08 7.83293647e−08]
Centroid: [0.33334377 0.66664891 0.3334235 ]
x_new: [[0.33357375 0.66656005 0.33335531]]
fx_new [6.96503144e−08]
Back to top
————————
xs: [[0.33323932 0.66657887 0.33338269]
 [0.33348316 0.66659604 0.3333634 ]
 [0.33316945 0.6666595  0.33343125]
 [0.33348723 0.66665828 0.33346697]
 [0.33339046 0.66678018 0.33350613]
 [0.333523   0.66653174 0.33332236]
 [0.33357375 0.66656005 0.33335531]]
fxs: [1.89833466e−08 2.83399880e−08 3.64966848e−08 4.16139147e−08
 4.60052921e−08 5.43012118e−08 6.96503144e−08]
Centroid: [0.33340948 0.66662352 0.33340402]
x_new: [[0.33324521 0.666687   0.33345272]]
fx_new [2.2432677e−08]
Back to top
————————
xs: [[0.33323932 0.66657887 0.33338269]
 [0.33324521 0.666687   0.33345272]
 [0.33348316 0.66659604 0.3333634 ]
 [0.33316945 0.6666595  0.33343125]
 [0.33348723 0.66665828 0.33346697]
 [0.33339046 0.66678018 0.33350613]
 [0.333523   0.66653174 0.33332236]]
fxs: [1.89833466e−08 2.24326770e−08 2.83399880e−08 3.64966848e−08
 4.16139147e−08 4.60052921e−08 5.43012118e−08]
Centroid: [0.33336255 0.66664166 0.33341793]
x_new: [[0.33320209 0.66675158 0.3335135 ]]
fx_new [5.68966275e−08]
Contracting
————————
xs: [[0.33341068 0.66660868 0.33338926]
 [0.33323932 0.66657887 0.33338269]
 [0.33324521 0.666687   0.33345272]
 [0.33348316 0.66659604 0.3333634 ]
 [0.33316945 0.6666595  0.33343125]
 [0.33348723 0.66665828 0.33346697]
 [0.33339046 0.66678018 0.33350613]]
fxs: [1.24732362e−08 1.89833466e−08 2.24326770e−08 2.83399880e−08
```

```
  3.64966848e−08 4.16139147e−08 4.60052921e−08]
Centroid: [0.3333465  0.66665265 0.33342749]
x_new: [[0.33330254 0.66652512 0.33334885]]
fx_new [2.1223291e−08]
Back to top
————————
xs: [[0.33341068 0.66660868 0.33338926]
 [0.33323932 0.66657887 0.33338269]
 [0.33330254 0.66652512 0.33334885]
 [0.33324521 0.666687   0.33345272]
 [0.33348316 0.66659604 0.3333634 ]
 [0.33316945 0.6666595  0.33343125]
 [0.33348723 0.66665828 0.33346697]]
fxs: [1.24732362e−08 1.89833466e−08 2.12232910e−08 2.24326770e−08
 2.83399880e−08 3.64966848e−08 4.16139147e−08]
Centroid: [0.33333394 0.66661621 0.33340502]
x_new: [[0.33318065 0.66657415 0.33334307]]
fx_new [3.19660648e−08]
Back to top
————————
xs: [[0.33341068 0.66660868 0.33338926]
 [0.33323932 0.66657887 0.33338269]
 [0.33330254 0.66652512 0.33334885]
 [0.33324521 0.666687   0.33345272]
 [0.33348316 0.66659604 0.3333634 ]
 [0.33318065 0.66657415 0.33334307]
 [0.33316945 0.6666595  0.33343125]]
fxs: [1.24732362e−08 1.89833466e−08 2.12232910e−08 2.24326770e−08
 2.83399880e−08 3.19660648e−08 3.64966848e−08]
Centroid: [0.33329014 0.66660419 0.33338732]
x_new: [[0.33341084 0.66654889 0.3333434 ]]
fx_new [1.99809357e−08]
Back to top
————————
xs: [[0.33341068 0.66660868 0.33338926]
 [0.33323932 0.66657887 0.33338269]
 [0.33341084 0.66654889 0.3333434 ]
 [0.33330254 0.66652512 0.33334885]
 [0.33324521 0.666687   0.33345272]
 [0.33348316 0.66659604 0.3333634 ]
 [0.33318065 0.66657415 0.33334307]]
fxs: [1.24732362e−08 1.89833466e−08 1.99809357e−08 2.12232910e−08
 2.24326770e−08 2.83399880e−08 3.19660648e−08]
Centroid: [0.33332463 0.66658839 0.33337477]
x_new: [[0.3334686  0.66660264 0.33340647]]
fx_new [2.77473897e−08]
Back to top
————————
xs: [[0.33341068 0.66660868 0.33338926]
 [0.33323932 0.66657887 0.33338269]
 [0.33341084 0.66654889 0.3333434 ]
 [0.33330254 0.66652512 0.33334885]
 [0.33324521 0.666687   0.33345272]
 [0.3334686  0.66660264 0.33340647]
 [0.33348316 0.66659604 0.3333634 ]]
fxs: [1.24732362e−08 1.89833466e−08 1.99809357e−08 2.12232910e−08
 2.24326770e−08 2.77473897e−08 2.83399880e−08]
Centroid: [0.33336576 0.66659246 0.33338383]
x_new: [[0.33324837 0.66658889 0.33340425]]
fx_new [1.82978426e−08]
Back to top
————————
xs: [[0.33341068 0.66660868 0.33338926]
 [0.33324837 0.66658889 0.33340425]
 [0.33323932 0.66657887 0.33338269]
 [0.33341084 0.66654889 0.3333434 ]
 [0.33330254 0.66652512 0.33334885]
 [0.33324521 0.666687   0.33345272]
 [0.3334686  0.66660264 0.33340647]]
fxs: [1.24732362e−08 1.82978426e−08 1.89833466e−08 1.99809357e−08
```

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   2.12232910e-08 2.24326770e-08 2.77473897e-08]
Centroid: [0.33333222 0.66659144 0.33338966]
x_new: [[0.33319584 0.66658024 0.33337286]]
fx_new [2.7934525e-08]
Contracting
————————
xs: [[0.33337314 0.6665948  0.33339471]
 [0.33341068 0.66660868 0.33338926]
 [0.33324837 0.66658889 0.33340425]
 [0.33323932 0.66657887 0.33338269]
 [0.33341084 0.66654889 0.3333434 ]
 [0.33330254 0.66652512 0.33334885]
 [0.33324521 0.666687   0.33345272]]
fxs: [1.05159854e-08 1.24732362e-08 1.82978426e-08 1.89833466e-08
 1.99809357e-08 2.12232910e-08 2.24326770e-08]
Centroid: [0.33331859 0.66659032 0.33338798]
x_new: [[0.33339196 0.66649365 0.33332324]]
fx_new [3.34750706e-08]
Contracting
————————
xs: [[0.33329657 0.66661932 0.33340741]
 [0.33337314 0.6665948  0.33339471]
 [0.33341068 0.66660868 0.33338926]
 [0.33324837 0.66658889 0.33340425]
 [0.33323932 0.66657887 0.33338269]
 [0.33341084 0.66654889 0.3333434 ]
 [0.33330254 0.66652512 0.33334885]]
fxs: [9.07934284e-09 1.05159854e-08 1.24732362e-08 1.82978426e-08
 1.89833466e-08 1.99809357e-08 2.12232910e-08]
Centroid: [0.33332592 0.66658065 0.33338151]
x_new: [[0.33334931 0.66663618 0.33341417]]
fx_new [7.71838565e-09]
Expanding
————————
xs: [[0.33334931 0.66663618 0.33341417]
 [0.33329657 0.66661932 0.33340741]
 [0.33337314 0.6665948  0.33339471]
 [0.33341068 0.66660868 0.33338926]
 [0.33324837 0.66658889 0.33340425]
 [0.33323932 0.66657887 0.33338269]
 [0.33341084 0.66654889 0.3333434 ]]
fxs: [7.71838565e-09 9.07934284e-09 1.05159854e-08 1.24732362e-08
 1.82978426e-08 1.89833466e-08 1.99809357e-08]
Centroid: [0.3333326  0.66659652 0.33339084]
x_new: [[0.33325437 0.66664415 0.33343828]]
fx_new [1.77570672e-08]
Back to top
————————
xs: [[0.33334931 0.66663618 0.33341417]
 [0.33329657 0.66661932 0.33340741]
 [0.33337314 0.6665948  0.33339471]
 [0.33341068 0.66660868 0.33338926]
 [0.33325437 0.66664415 0.33343828]
 [0.33324837 0.66658889 0.33340425]
 [0.33323932 0.66657887 0.33338269]]
fxs: [7.71838565e-09 9.07934284e-09 1.05159854e-08 1.24732362e-08
 1.77570672e-08 1.82978426e-08 1.89833466e-08]
Centroid: [0.33331025 0.66661013 0.3334044 ]
x_new: [[0.33338119 0.66664138 0.3334261 ]]
fx_new [1.15346663e-08]
Back to top
————————
xs: [[0.33334931 0.66663618 0.33341417]
 [0.33329657 0.66661932 0.33340741]
 [0.33337314 0.6665948  0.33339471]
 [0.33338119 0.66664138 0.3334261 ]
 [0.33341068 0.66660868 0.33338926]
 [0.33325437 0.66664415 0.33343828]
 [0.33324837 0.66658889 0.33340425]]
fxs: [7.71838565e-09 9.07934284e-09 1.05159854e-08 1.15346663e-08
```

```
  1.24732362e-08 1.77570672e-08 1.82978426e-08]
Centroid: [0.33333052 0.66661906 0.3334106 ]
x_new: [[0.33341266 0.66664923 0.33341694]]
fx_new [1.35875612e-08]
Back to top
————————
xs: [[0.33334931 0.66663618 0.33341417]
 [0.33329657 0.66661932 0.33340741]
 [0.33337314 0.6665948  0.33339471]
 [0.33338119 0.66664138 0.3334261 ]
 [0.33341068 0.66660868 0.33338926]
 [0.33341266 0.66664923 0.33341694]
 [0.33325437 0.66664415 0.33343828]]
fxs: [7.71838565e-09 9.07934284e-09 1.05159854e-08 1.15346663e-08
 1.24732362e-08 1.35875612e-08 1.77570672e-08]
Centroid: [0.33335399 0.66662768 0.33341241]
x_new: [[0.33345361 0.66661121 0.33338653]]
fx_new [2.0372496e-08]
Contracting
————————
xs: [[0.33334931 0.66663618 0.33341417]
 [0.3333241  0.66663262 0.33342017]
 [0.33329657 0.66661932 0.33340741]
 [0.33337314 0.6665948  0.33339471]
 [0.33338119 0.66664138 0.3334261 ]
 [0.33341068 0.66660868 0.33338926]
 [0.33341266 0.66664923 0.33341694]]
fxs: [7.71838565e-09 8.78518174e-09 9.07934284e-09 1.05159854e-08
 1.15346663e-08 1.24732362e-08 1.35875612e-08]
Centroid: [0.33336395 0.66662603 0.33340982]
x_new: [[0.33331524 0.66660283 0.3334027 ]]
fx_new [9.21436291e-09]
Back to top
————————
xs: [[0.33334931 0.66663618 0.33341417]
 [0.3333241  0.66663262 0.33342017]
 [0.33329657 0.66661932 0.33340741]
 [0.33331524 0.66660283 0.3334027 ]
 [0.33337314 0.6665948  0.33339471]
 [0.33338119 0.66664138 0.3334261 ]
 [0.33341068 0.66660868 0.33338926]]
fxs: [7.71838565e-09 8.78518174e-09 9.07934284e-09 9.21436291e-09
 1.05159854e-08 1.15346663e-08 1.24732362e-08]
Centroid: [0.33335003 0.6666194  0.33340779]
x_new: [[0.33328938 0.66663013 0.33342631]]
fx_new [1.19124826e-08]
Back to top
————————
xs: [[0.33334931 0.66663618 0.33341417]
 [0.3333241  0.66663262 0.33342017]
 [0.33329657 0.66661932 0.33340741]
 [0.33331524 0.66660283 0.3334027 ]
 [0.33337314 0.6665948  0.33339471]
 [0.33338119 0.66664138 0.3334261 ]
 [0.33328938 0.66663013 0.33342631]]
fxs: [7.71838565e-09 8.78518174e-09 9.07934284e-09 9.21436291e-09
 1.05159854e-08 1.15346663e-08 1.19124826e-08]
Centroid: [0.3333327  0.66662247 0.33341308]
x_new: [[0.33337603 0.66661481 0.33339985]]
fx_new [8.93607547e-09]
Back to top
————————
xs: [[0.33334931 0.66663618 0.33341417]
 [0.3333241  0.66663262 0.33342017]
 [0.33337603 0.66661481 0.33339985]
 [0.33329657 0.66661932 0.33340741]
 [0.33331524 0.66660283 0.3334027 ]
 [0.33337314 0.6665948  0.33339471]
 [0.33338119 0.66664138 0.3334261 ]]
fxs: [7.71838565e-09 8.78518174e-09 8.93607547e-09 9.07934284e-09
```

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   9.21436291e−09 1.05159854e−08 1.15346663e−08]
Centroid: [0.33334508 0.66662028 0.3334093 ]
x_new: [[0.33330898 0.66659917 0.3333925 ]]
fx_new [8.64932486e−09]
Back to top
————————
xs: [[0.33334931 0.66663618 0.33341417]
 [0.33330898 0.66659917 0.3333925 ]
 [0.3333241  0.66663262 0.33342017]
 [0.33337603 0.66661481 0.33339985]
 [0.33329657 0.66661932 0.33340741]
 [0.33331524 0.66660283 0.3334027 ]
 [0.33337314 0.6665948  0.33339471]]
fxs: [7.71838565e−09 8.64932486e−09 8.78518174e−09 8.93607547e−09
 9.07934284e−09 9.21436291e−09 1.05159854e−08]
Centroid: [0.33333477 0.66661425 0.3334045 ]
x_new: [[0.33329639 0.6666337  0.33341429]]
fx_new [9.00604844e−09]
Back to top
————————
xs: [[0.33334931 0.66663618 0.33341417]
 [0.33330898 0.66659917 0.3333925 ]
 [0.3333241  0.66663262 0.33342017]
 [0.33337603 0.66661481 0.33339985]
 [0.33329639 0.6666337  0.33341429]
 [0.33329657 0.66661932 0.33340741]
 [0.33331524 0.66660283 0.3334027 ]]
fxs: [7.71838565e−09 8.64932486e−09 8.78518174e−09 8.93607547e−09
 9.00604844e−09 9.07934284e−09 9.21436291e−09]
Centroid: [0.3333238  0.66661981 0.3334073 ]
x_new: [[0.33333237 0.66663678 0.33341189]]
fx_new [7.06594983e−09]
Expanding
————————
xs: [[0.33333237 0.66663678 0.33341189]
 [0.33334931 0.66663618 0.33341417]
 [0.33330898 0.66659917 0.3333925 ]
 [0.3333241  0.66663262 0.33342017]
 [0.33337603 0.66661481 0.33339985]
 [0.33329639 0.6666337  0.33341429]
 [0.33329657 0.66661932 0.33340741]]
fxs: [7.06594983e−09 7.71838565e−09 8.64932486e−09 8.78518174e−09
 8.93607547e−09 9.00604844e−09 9.07934284e−09]
Centroid: [0.33332625 0.66662466 0.33340861]
x_new: [[0.33335593 0.66662999 0.33340982]]
fx_new [7.70555467e−09]
Back to top
————————
xs: [[0.33333237 0.66663678 0.33341189]
 [0.33335593 0.66662999 0.33340982]
 [0.33334931 0.66663618 0.33341417]
 [0.33330898 0.66659917 0.3333925 ]
 [0.3333241  0.66663262 0.33342017]
 [0.33337603 0.66661481 0.33339985]
 [0.33329639 0.6666337  0.33341429]]
fxs: [7.06594983e−09 7.70555467e−09 7.71838565e−09 8.64932486e−09
 8.78518174e−09 8.93607547e−09 9.00604844e−09]
Centroid: [0.33333473 0.66662618 0.33340896]
x_new: [[0.33337306 0.66661866 0.33340362]]
fx_new [8.82313187e−09]
Back to top
————————
xs: [[0.33333237 0.66663678 0.33341189]
 [0.33335593 0.66662999 0.33340982]
 [0.33334931 0.66663618 0.33341417]
 [0.33330898 0.66659917 0.3333925 ]
 [0.3333241  0.66663262 0.33342017]
 [0.33337306 0.66661866 0.33340362]
 [0.33337603 0.66661481 0.33339985]]
fxs: [7.06594983e−09 7.70555467e−09 7.71838565e−09 8.64932486e−09
```

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  8.78518174e−09 8.82313187e−09 8.93607547e−09]
Centroid: [0.33334568 0.66662403 0.33340743]
x_new: [[0.33331534 0.66663325 0.33341501]]
fx_new [8.11215744e−09]
Back to top
——————————
xs: [[0.33333237 0.66663678 0.33341189]
 [0.33335593 0.66662999 0.33340982]
 [0.33334931 0.66663618 0.33341417]
 [0.33331534 0.66663325 0.33341501]
 [0.33330898 0.66659917 0.3333925 ]
 [0.3333241  0.66663262 0.33342017]
 [0.33337306 0.66661866 0.33340362]]
fxs: [7.06594983e−09 7.70555467e−09 7.71838565e−09 8.11215744e−09
 8.64932486e−09 8.78518174e−09 8.82313187e−09]
Centroid: [0.33333701 0.66662666 0.3334096 ]
x_new: [[0.33330096 0.66663467 0.33341558]]
fx_new [8.83579036e−09]
Contracting
——————————
xs: [[0.33333237 0.66663678 0.33341189]
 [0.33334783 0.66662426 0.3334078 ]
 [0.33335593 0.66662999 0.33340982]
 [0.33334931 0.66663618 0.33341417]
 [0.33331534 0.66663325 0.33341501]
 [0.33330898 0.66659917 0.3333925 ]
 [0.3333241  0.66663262 0.33342017]]
fxs: [7.06594983e−09 7.55393186e−09 7.70555467e−09 7.71838565e−09
 8.11215744e−09 8.64932486e−09 8.78518174e−09]
Centroid: [0.33333341 0.66662747 0.3334102 ]
x_new: [[0.33334271 0.66662231 0.33340022]]
fx_new [6.52912898e−09]
Expanding
——————————
xs: [[0.33335201 0.66661715 0.33339024]
 [0.33333237 0.66663678 0.33341189]
 [0.33334783 0.66662426 0.3334078 ]
 [0.33335593 0.66662999 0.33340982]
 [0.33334931 0.66663618 0.33341417]
 [0.33331534 0.66663325 0.33341501]
 [0.33330898 0.66659917 0.3333925 ]]
fxs: [6.03908054e−09 7.06594983e−09 7.55393186e−09 7.70555467e−09
 7.71838565e−09 8.11215744e−09 8.64932486e−09]
Centroid: [0.33333739 0.66662526 0.33340592]
x_new: [[0.33336581 0.66665134 0.33341934]]
fx_new [8.68656828e−09]
Contracting
——————————
xs: [[0.33335201 0.66661715 0.33339024]
 [0.33333237 0.66663678 0.33341189]
 [0.33332887 0.66661743 0.33340189]
 [0.33334783 0.66662426 0.3334078 ]
 [0.33335593 0.66662999 0.33340982]
 [0.33334931 0.66663618 0.33341417]
 [0.33331534 0.66663325 0.33341501]]
fxs: [6.03908054e−09 7.06594983e−09 7.14463428e−09 7.55393186e−09
 7.70555467e−09 7.71838565e−09 8.11215744e−09]
Centroid: [0.33334023 0.66662786 0.33340726]
x_new: [[0.33336513 0.66662248 0.33339951]]
fx_new [7.34327165e−09]
Back to top
——————————
xs: [[0.33335201 0.66661715 0.33339024]
 [0.33333237 0.66663678 0.33341189]
 [0.33332887 0.66661743 0.33340189]
 [0.33336513 0.66662248 0.33339951]
 [0.33334783 0.66662426 0.3334078 ]
 [0.33335593 0.66662999 0.33340982]
 [0.33334931 0.66663618 0.33341417]]
fxs: [6.03908054e−09 7.06594983e−09 7.14463428e−09 7.34327165e−09
```

```
 7.55393186e−09  7.70555467e−09  7.71838565e−09]
Centroid:  [0.33334735  0.66662632  0.33340505]
x_new:  [[0.33334539  0.66661647  0.33339593]]
fx_new  [6.58337546e−09]
Back  to  top
―――――――――
xs:  [[0.33335201  0.66661715  0.33339024]
 [0.33334539  0.66661647  0.33339593]
 [0.33333237  0.66663678  0.33341189]
 [0.33332887  0.66661743  0.33340189]
 [0.33336513  0.66662248  0.33339951]
 [0.33334783  0.66662426  0.3334078 ]
 [0.33335593  0.66662999  0.33340982]]
fxs:  [6.03908054e−09  6.58337546e−09  7.06594983e−09  7.14463428e−09
 7.34327165e−09  7.55393186e−09  7.70555467e−09]
Centroid:  [0.33334679  0.66662351  0.33340244]
x_new:  [[0.33333765  0.66661703  0.33339506]]
fx_new  [6.29331988e−09]
Back  to  top
―――――――――
xs:  [[0.33335201  0.66661715  0.33339024]
 [0.33333765  0.66661703  0.33339506]
 [0.33334539  0.66661647  0.33339593]
 [0.33333237  0.66663678  0.33341189]
 [0.33332887  0.66661743  0.33340189]
 [0.33336513  0.66662248  0.33339951]
 [0.33334783  0.66662426  0.3334078 ]]
fxs:  [6.03908054e−09  6.29331988e−09  6.58337546e−09  7.06594983e−09
 7.14463428e−09  7.34327165e−09  7.55393186e−09]
Centroid:  [0.33334418  0.66662166  0.33340033]
x_new:  [[0.33334053  0.66661905  0.33339286]]
fx_new  [5.86291261e−09]
Expanding
―――――――――
xs:  [[0.33333688  0.66661644  0.33338539]
 [0.33335201  0.66661715  0.33339024]
 [0.33333765  0.66661703  0.33339506]
 [0.33334539  0.66661647  0.33339593]
 [0.33333237  0.66663678  0.33341189]
 [0.33332887  0.66661743  0.33340189]
 [0.33336513  0.66662248  0.33339951]]
fxs:  [5.24510177e−09  6.03908054e−09  6.29331988e−09  6.58337546e−09
 7.06594983e−09  7.14463428e−09  7.34327165e−09]
Centroid:  [0.33334262  0.66662054  0.33339713]
x_new:  [[0.3333201   0.6666186   0.33339475]]
fx_new  [6.25783606e−09]
Back  to  top
―――――――――
xs:  [[0.33333688  0.66661644  0.33338539]
 [0.33335201  0.66661715  0.33339024]
 [0.3333201   0.6666186   0.33339475]
 [0.33333765  0.66661703  0.33339506]
 [0.33334539  0.66661647  0.33339593]
 [0.33333237  0.66663678  0.33341189]
 [0.33332887  0.66661743  0.33340189]]
fxs:  [5.24510177e−09  6.03908054e−09  6.25783606e−09  6.29331988e−09
 6.58337546e−09  7.06594983e−09  7.14463428e−09]
Centroid:  [0.33333618  0.66661999  0.33339645]
x_new:  [[0.3333435   0.66662254  0.33339101]]
fx_new  [5.37701549e−09]
Back  to  top
―――――――――
xs:  [[0.33333688  0.66661644  0.33338539]
 [0.3333435   0.66662254  0.33339101]
 [0.33335201  0.66661715  0.33339024]
 [0.3333201   0.6666186   0.33339475]
 [0.33333765  0.66661703  0.33339506]
 [0.33334539  0.66661647  0.33339593]
 [0.33333237  0.66663678  0.33341189]]
fxs:  [5.24510177e−09  5.37701549e−09  6.03908054e−09  6.25783606e−09
```

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  6.29331988e−09 6.58337546e−09 7.06594983e−09]
Centroid: [0.33333827 0.66662072 0.3333949 ]
x_new: [[0.33334418 0.66660466 0.3333779 ]]
fx_new [5.94936714e−09]
Back to top
————————
xs: [[0.33333688 0.66661644 0.33338539]
 [0.3333435  0.66662254 0.33339101]
 [0.33334418 0.66660466 0.3333779 ]
 [0.33335201 0.66661715 0.33339024]
 [0.3333201  0.6666186  0.33339475]
 [0.33333765 0.66661703 0.33339506]
 [0.33334539 0.66661647 0.33339593]]
fxs: [5.24510177e−09 5.37701549e−09 5.94936714e−09 6.03908054e−09
 6.25783606e−09 6.29331988e−09 6.58337546e−09]
Centroid: [0.33333996 0.66661613 0.33339004]
x_new: [[0.33333453 0.66661579 0.33338416]]
fx_new [5.17306438e−09]
Expanding
————————
xs: [[0.33332909 0.66661545 0.33337827]
 [0.33333688 0.66661644 0.33338539]
 [0.3333435  0.66662254 0.33339101]
 [0.33334418 0.66660466 0.3333779 ]
 [0.33335201 0.66661715 0.33339024]
 [0.3333201  0.6666186  0.33339475]
 [0.33333765 0.66661703 0.33339506]]
fxs: [4.66066083e−09 5.24510177e−09 5.37701549e−09 5.94936714e−09
 6.03908054e−09 6.25783606e−09 6.29331988e−09]
Centroid: [0.33333763 0.66661598 0.33338752]
x_new: [[0.33333761 0.66661494 0.33337998]]
fx_new [4.86982341e−09]
Back to top
————————
xs: [[0.33332909 0.66661545 0.33337827]
 [0.33333761 0.66661494 0.33337998]
 [0.33333688 0.66661644 0.33338539]
 [0.3333435  0.66662254 0.33339101]
 [0.33334418 0.66660466 0.3333779 ]
 [0.33335201 0.66661715 0.33339024]
 [0.3333201  0.6666186  0.33339475]]
fxs: [4.66066083e−09 4.86982341e−09 5.24510177e−09 5.37701549e−09
 5.94936714e−09 6.03908054e−09 6.25783606e−09]
Centroid: [0.33333762 0.66661568 0.33338537]
x_new: [[0.33335515 0.66661276 0.33337598]]
fx_new [5.19973719e−09]
Back to top
————————
xs: [[0.33332909 0.66661545 0.33337827]
 [0.33333761 0.66661494 0.33337998]
 [0.33335515 0.66661276 0.33337598]
 [0.33333688 0.66661644 0.33338539]
 [0.3333435  0.66662254 0.33339101]
 [0.33334418 0.66660466 0.3333779 ]
 [0.33335201 0.66661715 0.33339024]]
fxs: [4.66066083e−09 4.86982341e−09 5.19973719e−09 5.24510177e−09
 5.37701549e−09 5.94936714e−09 6.03908054e−09]
Centroid: [0.33334263 0.66661485 0.33338268]
x_new: [[0.33333325 0.66661255 0.33337512]]
fx_new [4.67538087e−09]
Back to top
————————
xs: [[0.33332909 0.66661545 0.33337827]
 [0.33333325 0.66661255 0.33337512]
 [0.33333761 0.66661494 0.33337998]
 [0.33335515 0.66661276 0.33337598]
 [0.33333688 0.66661644 0.33338539]
 [0.3333435  0.66662254 0.33339101]
 [0.33334418 0.66660466 0.3333779 ]]
fxs: [4.66066083e−09 4.67538087e−09 4.86982341e−09 5.19973719e−09
```

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  5.24510177e−09 5.37701549e−09 5.94936714e−09]
Centroid: [0.33333995 0.66661419 0.33338052]
x_new: [[0.33333573 0.66662373 0.33338314]]
fx_new [4.33035971e−09]
Expanding
——————————
xs: [[0.3333315   0.66663326 0.33338576]
 [0.33332909 0.66661545 0.33337827]
 [0.33333325 0.66661255 0.33337512]
 [0.33333761 0.66661494 0.33337998]
 [0.33335515 0.66661276 0.33337598]
 [0.33333688 0.66661644 0.33338539]
 [0.3333435  0.66662254 0.33339101]]
fxs: [3.86778680e−09 4.66066083e−09 4.67538087e−09 4.86982341e−09
 5.19973719e−09 5.24510177e−09 5.37701549e−09]
Centroid: [0.33333814 0.66661828 0.33338164]
x_new: [[0.33333278 0.66661401 0.33337228]]
fx_new [4.28925812e−09]
Back to top
——————————
xs: [[0.3333315   0.66663326 0.33338576]
 [0.33333278 0.66661401 0.33337228]
 [0.33332909 0.66661545 0.33337827]
 [0.33333325 0.66661255 0.33337512]
 [0.33333761 0.66661494 0.33337998]
 [0.33335515 0.66661276 0.33337598]
 [0.33333688 0.66661644 0.33338539]]
fxs: [3.86778680e−09 4.28925812e−09 4.66066083e−09 4.67538087e−09
 4.86982341e−09 5.19973719e−09 5.24510177e−09]
Centroid: [0.33333661 0.66661706 0.33337897]
x_new: [[0.33333634 0.66661768 0.33337254]]
fx_new [3.94661393e−09]
Back to top
——————————
xs: [[0.3333315   0.66663326 0.33338576]
 [0.33333634 0.66661768 0.33337254]
 [0.33333278 0.66661401 0.33337228]
 [0.33332909 0.66661545 0.33337827]
 [0.33333325 0.66661255 0.33337512]
 [0.33333761 0.66661494 0.33337998]
 [0.33335515 0.66661276 0.33337598]]
fxs: [3.86778680e−09 3.94661393e−09 4.28925812e−09 4.66066083e−09
 4.67538087e−09 4.86982341e−09 5.19973719e−09]
Centroid: [0.33333653 0.66661724 0.33337713]
x_new: [[0.33331791 0.66662171 0.33337829]]
fx_new [4.28025268e−09]
Back to top
——————————
xs: [[0.3333315   0.66663326 0.33338576]
 [0.33333634 0.66661768 0.33337254]
 [0.33331791 0.66662171 0.33337829]
 [0.33333278 0.66661401 0.33337228]
 [0.33332909 0.66661545 0.33337827]
 [0.33333325 0.66661255 0.33337512]
 [0.33333761 0.66661494 0.33337998]]
fxs: [3.86778680e−09 3.94661393e−09 4.28025268e−09 4.28925812e−09
 4.66066083e−09 4.67538087e−09 4.86982341e−09]
Centroid: [0.33333121 0.66661851 0.33337746]
x_new: [[0.33332482 0.66662209 0.33337495]]
fx_new [3.79161606e−09]
Expanding
——————————
xs: [[0.33331842 0.66662567 0.33337244]
 [0.3333315   0.66663326 0.33338576]
 [0.33333634 0.66661768 0.33337254]
 [0.33331791 0.66662171 0.33337829]
 [0.33333278 0.66661401 0.33337228]
 [0.33332909 0.66661545 0.33337827]
 [0.33333325 0.66661255 0.33337512]]
fxs: [3.43252363e−09 3.86778680e−09 3.94661393e−09 4.28025268e−09
```

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```
 4.28925812e−09 4.66066083e−09 4.67538087e−09]
Centroid: [0.33332847 0.66662005 0.33337639]
x_new: [[0.33332369 0.66662755 0.33337765]]
fx_new [3.5873724e−09]
Back to top
——————————
xs: [[0.33331842 0.66662567 0.33337244]
 [0.33332369 0.66662755 0.33337765]
 [0.3333315  0.66663326 0.33338576]
 [0.33333634 0.66661768 0.33337254]
 [0.33331791 0.66662171 0.33337829]
 [0.33333278 0.66661401 0.33337228]
 [0.33332909 0.66661545 0.33337827]]
fxs: [3.43252363e−09 3.58737240e−09 3.86778680e−09 3.94661393e−09
 4.28025268e−09 4.28925812e−09 4.66066083e−09]
Centroid: [0.33332711 0.66662219 0.33337675]
x_new: [[0.33332512 0.66662893 0.33337522]]
fx_new [3.24640016e−09]
Expanding
——————————
xs: [[0.33332313 0.66663567 0.3333737 ]
 [0.33331842 0.66662567 0.33337244]
 [0.33332369 0.66662755 0.33337765]
 [0.3333315  0.66663326 0.33338576]
 [0.33333634 0.66661768 0.33337254]
 [0.33331791 0.66662171 0.33337829]
 [0.33333278 0.66661401 0.33337228]]
fxs: [2.69431335e−09 3.43252363e−09 3.58737240e−09 3.86778680e−09
 3.94661393e−09 4.28025268e−09 4.28925812e−09]
Centroid: [0.33332625 0.66662508 0.33337609]
x_new: [[0.33331972 0.66663614 0.33337991]]
fx_new [3.28648408e−09]
Back to top
——————————
xs: [[0.33332313 0.66663567 0.3333737 ]
 [0.33331972 0.66663614 0.33337991]
 [0.33331842 0.66662567 0.33337244]
 [0.33332369 0.66662755 0.33337765]
 [0.3333315  0.66663326 0.33338576]
 [0.33333634 0.66661768 0.33337254]
 [0.33331791 0.66662171 0.33337829]]
fxs: [2.69431335e−09 3.28648408e−09 3.43252363e−09 3.58737240e−09
 3.86778680e−09 3.94661393e−09 4.28025268e−09]
Centroid: [0.33332439 0.66662824 0.33337718]
x_new: [[0.33333086 0.66663477 0.33337608]]
fx_new [2.85073404e−09]
Back to top
——————————
xs: [[0.33332313 0.66663567 0.3333737 ]
 [0.33333086 0.66663477 0.33337608]
 [0.33331972 0.66663614 0.33337991]
 [0.33331842 0.66662567 0.33337244]
 [0.33332369 0.66662755 0.33337765]
 [0.3333315  0.66663326 0.33338576]
 [0.33333634 0.66661768 0.33337254]]
fxs: [2.69431335e−09 2.85073404e−09 3.28648408e−09 3.43252363e−09
 3.58737240e−09 3.86778680e−09 3.94661393e−09]
Centroid: [0.33332624 0.6666301  0.33337687]
x_new: [[0.33331614 0.66664253 0.33338119]]
fx_new [3.16858922e−09]
Back to top
——————————
xs: [[0.33332313 0.66663567 0.3333737 ]
 [0.33333086 0.66663477 0.33337608]
 [0.33331614 0.66664253 0.33338119]
 [0.33331972 0.66663614 0.33337991]
 [0.33331842 0.66662567 0.33337244]
 [0.33332369 0.66662755 0.33337765]
 [0.3333315  0.66663326 0.33338576]]
fxs: [2.69431335e−09 2.85073404e−09 3.16858922e−09 3.28648408e−09
```

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```
   3.43252363e−09 3.58737240e−09 3.86778680e−09]
Centroid: [0.33332335 0.66663365 0.3333781 ]
x_new: [[0.33331521 0.66663405 0.33337045]]
fx_new [2.770096e−09]
Back to top
————————————
xs: [[0.33332313 0.66663567 0.3333737 ]
 [0.33331521 0.66663405 0.33337045]
 [0.33333086 0.66663477 0.33337608]
 [0.33331614 0.66664253 0.33338119]
 [0.33331972 0.66663614 0.33337991]
 [0.33331842 0.66662567 0.33337244]
 [0.33332369 0.66662755 0.33337765]]
fxs: [2.69431335e−09 2.77009600e−09 2.85073404e−09 3.16858922e−09
 3.28648408e−09 3.43252363e−09 3.58737240e−09]
Centroid: [0.33332103 0.66663377 0.33337592]
x_new: [[0.33331836 0.66663999 0.33337418]]
fx_new [2.60463555e−09]
Expanding
————————————
xs: [[0.33331569 0.66664621 0.33337245]
 [0.33332313 0.66663567 0.3333737 ]
 [0.33331521 0.66663405 0.33337045]
 [0.33333086 0.66663477 0.33337608]
 [0.33331614 0.66664253 0.33338119]
 [0.33331972 0.66663614 0.33337991]
 [0.33331842 0.66662567 0.33337244]]
fxs: [2.25969246e−09 2.69431335e−09 2.77009600e−09 2.85073404e−09
 3.16858922e−09 3.28648408e−09 3.43252363e−09]
Centroid: [0.33331988 0.66663643 0.33337517]
x_new: [[0.33332134 0.6666472  0.33337791]]
fx_new [2.50964049e−09]
Back to top
————————————
xs: [[0.33331569 0.66664621 0.33337245]
 [0.33332134 0.6666472  0.33337791]
 [0.33332313 0.66663567 0.3333737 ]
 [0.33331521 0.66663405 0.33337045]
 [0.33333086 0.66663477 0.33337608]
 [0.33331614 0.66664253 0.33338119]
 [0.33331972 0.66663614 0.33337991]]
fxs: [2.25969246e−09 2.50964049e−09 2.69431335e−09 2.77009600e−09
 2.85073404e−09 3.16858922e−09 3.28648408e−09]
Centroid: [0.3333203  0.66663951 0.33337595]
x_new: [[0.33332088 0.66664288 0.333372   ]]
fx_new [2.21612565e−09]
Expanding
————————————
xs: [[0.33332145 0.66664624 0.33336804]
 [0.33331569 0.66664621 0.33337245]
 [0.33332134 0.6666472  0.33337791]
 [0.33332313 0.66663567 0.3333737 ]
 [0.33331521 0.66663405 0.33337045]
 [0.33333086 0.66663477 0.33337608]
 [0.33331614 0.66664253 0.33338119]]
fxs: [1.76292407e−09 2.25969246e−09 2.50964049e−09 2.69431335e−09
 2.77009600e−09 2.85073404e−09 3.16858922e−09]
Centroid: [0.33332055 0.66664095 0.33337426]
x_new: [[0.33332495 0.66663937 0.33336732]]
fx_new [1.97067753e−09]
Back to top
————————————
xs: [[0.33332145 0.66664624 0.33336804]
 [0.33332495 0.66663937 0.33336732]
 [0.33331569 0.66664621 0.33337245]
 [0.33332134 0.6666472  0.33337791]
 [0.33332313 0.66663567 0.3333737 ]
 [0.33331521 0.66663405 0.33337045]
 [0.33333086 0.66663477 0.33337608]]
fxs: [1.76292407e−09 1.97067753e−09 2.25969246e−09 2.50964049e−09
```

```
2.69431335e−09 2.77009600e−09 2.85073404e−09]
Centroid: [0.33332181 0.6666405  0.33337228]
x_new: [[0.33331275 0.66664623 0.33336848]]
fx_new [2.07636714e−09]
Back to top
—————————
xs: [[0.33332145 0.66664624 0.33336804]
 [0.33332495 0.66663937 0.33336732]
 [0.33331275 0.66664623 0.33336848]
 [0.33331569 0.66664621 0.33337245]
 [0.33332134 0.6666472  0.33337791]
 [0.33332313 0.66663567 0.3333737 ]
 [0.33331521 0.66663405 0.33337045]]
fxs: [1.76292407e−09 1.97067753e−09 2.07636714e−09 2.25969246e−09
 2.50964049e−09 2.69431335e−09 2.77009600e−09]
Centroid: [0.33331922 0.66664214 0.33337119]
x_new: [[0.33332323 0.66665023 0.33337194]]
fx_new [1.86244322e−09]
Back to top
—————————
xs: [[0.33332145 0.66664624 0.33336804]
 [0.33332323 0.66665023 0.33337194]
 [0.33332495 0.66663937 0.33336732]
 [0.33331275 0.66664623 0.33336848]
 [0.33331569 0.66664621 0.33337245]
 [0.33332134 0.6666472  0.33337791]
 [0.33332313 0.66663567 0.3333737 ]]
fxs: [1.76292407e−09 1.86244322e−09 1.97067753e−09 2.07636714e−09
 2.25969246e−09 2.50964049e−09 2.69431335e−09]
Centroid: [0.33332036 0.66664445 0.3333714 ]
x_new: [[0.3333176  0.66665323 0.33336911]]
fx_new [1.70818082e−09]
Expanding
—————————
xs: [[0.33331483 0.66666202 0.33336682]
 [0.33332145 0.66664624 0.33336804]
 [0.33332323 0.66665023 0.33337194]
 [0.33332495 0.66663937 0.33336732]
 [0.33331275 0.66664623 0.33336848]
 [0.33331569 0.66664621 0.33337245]
 [0.33332134 0.6666472  0.33337791]]
fxs: [1.48528016e−09 1.76292407e−09 1.86244322e−09 1.97067753e−09
 2.07636714e−09 2.25969246e−09 2.50964049e−09]
Centroid: [0.33331918 0.66664821 0.33337042]
x_new: [[0.33331701 0.66664923 0.33336294]]
fx_new [1.44670773e−09]
Expanding
—————————
xs: [[0.33331485 0.66665025 0.33335545]
 [0.33331483 0.66666202 0.33336682]
 [0.33332145 0.66664624 0.33336804]
 [0.33332323 0.66665023 0.33337194]
 [0.33332495 0.66663937 0.33336732]
 [0.33331275 0.66664623 0.33336848]
 [0.33331569 0.66664621 0.33337245]]
fxs: [1.10050811e−09 1.48528016e−09 1.76292407e−09 1.86244322e−09
 1.97067753e−09 2.07636714e−09 2.25969246e−09]
Centroid: [0.33331825 0.66664865 0.33336721]
x_new: [[0.33332081 0.66665109 0.33336198]]
fx_new [1.22008599e−09]
Back to top
—————————
xs: [[0.33331485 0.66665025 0.33335545]
 [0.33332081 0.66665109 0.33336198]
 [0.33331483 0.66666202 0.33336682]
 [0.33332145 0.66664624 0.33336804]
 [0.33332323 0.66665023 0.33337194]
 [0.33332495 0.66663937 0.33336732]
 [0.33331275 0.66664623 0.33336848]]
fxs: [1.10050811e−09 1.22008599e−09 1.48528016e−09 1.76292407e−09
```

```
1.86244322e−09 1.97067753e−09 2.07636714e−09]
Centroid: [0.33331898 0.66664935 0.33336572]
x_new: [[0.33332522 0.66665246 0.33336296]]
fx_new [1.1454346e−09]
Back to top
————————————
xs: [[0.33331485 0.66665025 0.33335545]
 [0.33332522 0.66665246 0.33336296]
 [0.33332081 0.66665109 0.33336198]
 [0.33331483 0.66666202 0.33336682]
 [0.33332145 0.66664624 0.33336804]
 [0.33332323 0.66665023 0.33337194]
 [0.33332495 0.66663937 0.33336732]]
fxs: [1.10050811e−09 1.14543460e−09 1.22008599e−09
 1.76292407e−09 1.86244322e−09 1.97067753e−09]
Centroid: [0.33332076 0.66665024 0.33336493]
x_new: [[0.33331657 0.6666611  0.33336254]]
fx_new [1.1647047e−09]
Back to top
————————————
xs: [[0.33331485 0.66665025 0.33335545]
 [0.33332522 0.66665246 0.33336296]
 [0.33331657 0.6666611  0.33336254]
 [0.33332081 0.66665109 0.33336198]
 [0.33331483 0.66666202 0.33336682]
 [0.33332145 0.66664624 0.33336804]
 [0.33332323 0.66665023 0.33337194]]
fxs: [1.10050811e−09 1.14543460e−09 1.16470470e−09 1.22008599e−09
 1.48528016e−09 1.76292407e−09 1.86244322e−09]
Centroid: [0.33331957 0.66665334 0.33336425]
x_new: [[0.3333159  0.66665645 0.33335656]]
fx_new [9.47490745e−10]
Expanding
————————————
xs: [[0.33331224 0.66665957 0.33334887]
 [0.33331485 0.66665025 0.33335545]
 [0.33332522 0.66665246 0.33336296]
 [0.33331657 0.6666611  0.33336254]
 [0.33332081 0.66665109 0.33336198]
 [0.33331483 0.66666202 0.33336682]
 [0.33332145 0.66664624 0.33336804]]
fxs: [7.36732146e−10 1.10050811e−09 1.14543460e−09 1.16470470e−09
 1.22008599e−09 1.48528016e−09 1.76292407e−09]
Centroid: [0.333318   0.66665468 0.33336095]
x_new: [[0.33331454 0.66666311 0.33335386]]
fx_new [7.87264162e−10]
Back to top
————————————
xs: [[0.33331224 0.66665957 0.33334887]
 [0.33331454 0.66666311 0.33335386]
 [0.33331485 0.66665025 0.33335545]
 [0.33332522 0.66665246 0.33336296]
 [0.33331657 0.6666611  0.33336254]
 [0.33332081 0.66665109 0.33336198]
 [0.33331483 0.66666202 0.33336682]]
fxs: [7.36732146e−10 7.87264162e−10 1.10050811e−09 1.14543460e−09
 1.16470470e−09 1.22008599e−09 1.48528016e−09]
Centroid: [0.33331701 0.66665709 0.33335893]
x_new: [[0.33331918 0.66665215 0.33335103]]
fx_new [7.24022717e−10]
Expanding
————————————
xs: [[0.33332136 0.66664722 0.33334314]
 [0.33331224 0.66665957 0.33334887]
 [0.33331454 0.66666311 0.33335386]
 [0.33331485 0.66665025 0.33335545]
 [0.33332522 0.66665246 0.33336296]
 [0.33331657 0.6666611  0.33336254]
 [0.33332081 0.66665109 0.33336198]]
fxs: [6.17522824e−10 7.36732146e−10 7.87264162e−10 1.10050811e−09
```

```
 1.14543460e−09 1.16470470e−09 1.22008599e−09]
Centroid: [0.33331794 0.66665497 0.33335554]
x_new: [[0.33331507 0.66665885 0.3333491 ]]
fx_new [6.43271878e−10]
Back to top
——————————
xs: [[0.33332136 0.66664722 0.33334314]
 [0.33331507 0.66665885 0.3333491 ]
 [0.33331224 0.66665957 0.33334887]
 [0.33331454 0.66666311 0.33335386]
 [0.33331485 0.66665025 0.33335545]
 [0.33332522 0.66665246 0.33336296]
 [0.33331657 0.6666611  0.33336254]]
fxs: [6.17522824e−10 6.43271878e−10 7.36732146e−10 7.87264162e−10
 1.10050811e−09 1.14543460e−09 1.16470470e−09]
Centroid: [0.33331712 0.66665608 0.3333537 ]
x_new: [[0.33331767 0.66665106 0.33334487]]
fx_new [6.22091113e−10]
Back to top
——————————
xs: [[0.33332136 0.66664722 0.33334314]
 [0.33331767 0.66665106 0.33334487]
 [0.33331507 0.66665885 0.3333491 ]
 [0.33331224 0.66665957 0.33334887]
 [0.33331454 0.66666311 0.33335386]
 [0.33331485 0.66665025 0.33335545]
 [0.33332522 0.66665246 0.33336296]]
fxs: [6.17522824e−10 6.22091113e−10 6.43271878e−10 7.36732146e−10
 7.87264162e−10 1.10050811e−09 1.14543460e−09]
Centroid: [0.33331728 0.66665464 0.33335118]
x_new: [[0.33330934 0.66665683 0.3333394 ]]
fx_new [7.09291933e−10]
Back to top
——————————
xs: [[0.33332136 0.66664722 0.33334314]
 [0.33331767 0.66665106 0.33334487]
 [0.33331507 0.66665885 0.3333491 ]
 [0.33330934 0.66665683 0.3333394 ]
 [0.33331224 0.66665957 0.33334887]
 [0.33331454 0.66666311 0.33335386]
 [0.33331485 0.66665025 0.33335545]]
fxs: [6.17522824e−10 6.22091113e−10 6.43271878e−10 7.09291933e−10
 7.36732146e−10 7.87264162e−10 1.10050811e−09]
Centroid: [0.33331501 0.66665527 0.33334781]
x_new: [[0.33331517 0.66666029 0.33334017]]
fx_new [4.17333827e−10]
Expanding
——————————
xs: [[0.33331533 0.66666531 0.33333253]
 [0.33332136 0.66664722 0.33334314]
 [0.33331767 0.66665106 0.33334487]
 [0.33331507 0.66665885 0.3333491 ]
 [0.33330934 0.66665683 0.3333394 ]
 [0.33331224 0.66665957 0.33334887]
 [0.33331454 0.66666311 0.33335386]]
fxs: [3.26565202e−10 6.17522824e−10 6.22091113e−10 6.43271878e−10
 7.09291933e−10 7.36732146e−10 7.87264162e−10]
Centroid: [0.33331508 0.66665742 0.33334454]
x_new: [[0.33331562 0.66665173 0.33333522]]
fx_new [5.40363779e−10]
Back to top
——————————
xs: [[0.33331533 0.66666531 0.33333253]
 [0.33331562 0.66665173 0.33333522]
 [0.33332136 0.66664722 0.33334314]
 [0.33331767 0.66665106 0.33334487]
 [0.33331507 0.66665885 0.3333491 ]
 [0.33330934 0.66665683 0.3333394 ]
 [0.33331224 0.66665957 0.33334887]]
fxs: [3.26565202e−10 5.40363779e−10 6.17522824e−10 6.22091113e−10
```

```
6.43271878e−10 7.09291933e−10 7.36732146e−10]
Centroid: [0.33331523 0.6666558  0.33334187]
x_new: [[0.33331823 0.66665203 0.33333488]]
fx_new [4.44997784e−10]
Back to top
——————————
xs: [[0.33331533 0.66666531 0.33333253]
 [0.33331823 0.66665203 0.33333488]
 [0.33331562 0.66665173 0.33333522]
 [0.33332136 0.66664722 0.33334314]
 [0.33331767 0.66665106 0.33334487]
 [0.33331507 0.66665885 0.3333491 ]
 [0.33330934 0.66665683 0.3333394 ]]
fxs: [3.26565202e−10 4.44997784e−10 5.40363779e−10 6.17522824e−10
 6.22091113e−10 6.43271878e−10 7.09291933e−10]
Centroid: [0.33331609 0.66665472 0.33333988]
x_new: [[0.33332284 0.66665261 0.33334036]]
fx_new [3.57092593e−10]
Back to top
——————————
xs: [[0.33331533 0.66666531 0.33333253]
 [0.33332284 0.66665261 0.33334036]
 [0.33331823 0.66665203 0.33333488]
 [0.33331562 0.66665173 0.33333522]
 [0.33332136 0.66664722 0.33334314]
 [0.33331767 0.66665106 0.33334487]
 [0.33331507 0.66665885 0.3333491 ]]
fxs: [3.26565202e−10 3.57092593e−10 4.44997784e−10 5.40363779e−10
 6.17522824e−10 6.22091113e−10 6.43271878e−10]
Centroid: [0.33331802 0.66665412 0.33334001]
x_new: [[0.33332096 0.66664938 0.33333092]]
fx_new [4.57671005e−10]
Back to top
——————————
xs: [[0.33331533 0.66666531 0.33333253]
 [0.33332284 0.66665261 0.33334036]
 [0.33331823 0.66665203 0.33333488]
 [0.33332096 0.66664938 0.33333092]
 [0.33331562 0.66665173 0.33333522]
 [0.33332136 0.66664722 0.33334314]
 [0.33331767 0.66665106 0.33334487]]
fxs: [3.26565202e−10 3.57092593e−10 4.44997784e−10 4.57671005e−10
 5.40363779e−10 6.17522824e−10 6.22091113e−10]
Centroid: [0.33331886 0.66665276 0.33333742]
x_new: [[0.33332005 0.66665447 0.33332997]]
fx_new [3.36659712e−10]
Back to top
——————————
xs: [[0.33331533 0.66666531 0.33333253]
 [0.33332005 0.66665447 0.33332997]
 [0.33332284 0.66665261 0.33334036]
 [0.33331823 0.66665203 0.33333488]
 [0.33332096 0.66664938 0.33333092]
 [0.33331562 0.66665173 0.33333522]
 [0.33332136 0.66664722 0.33334314]]
fxs: [3.26565202e−10 3.36659712e−10 3.57092593e−10 4.44997784e−10
 4.57671005e−10 5.40363779e−10 6.17522824e−10]
Centroid: [0.3333192  0.66665325 0.33333529]
x_new: [[0.33331703 0.66665928 0.33332744]]
fx_new [3.55012701e−10]
Back to top
——————————
xs: [[0.33331533 0.66666531 0.33333253]
 [0.33332005 0.66665447 0.33332997]
 [0.33331703 0.66665928 0.33332744]
 [0.33332284 0.66665261 0.33334036]
 [0.33331823 0.66665203 0.33333488]
 [0.33332096 0.66664938 0.33333092]
 [0.33331562 0.66665173 0.33333522]]
fxs: [3.26565202e−10 3.36659712e−10 3.55012701e−10 3.57092593e−10
```

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```
 4.44997784e-10 4.57671005e-10 5.40363779e-10]
Centroid: [0.33331858 0.66665497 0.33333305]
x_new: [[0.33332154 0.66665821 0.33333087]]
fx_new [2.1660482e-10]
Expanding
————————
xs: [[0.3333245  0.66666145 0.3333287 ]
 [0.33331533 0.66666531 0.33333253]
 [0.33332005 0.66665447 0.33332997]
 [0.33331703 0.66665928 0.33332744]
 [0.33332284 0.66665261 0.33334036]
 [0.33331823 0.66665203 0.33333488]
 [0.33332096 0.66664938 0.33333092]]
fxs: [1.26639914e-10 3.26565202e-10 3.36659712e-10 3.55012701e-10
 3.57092593e-10 4.44997784e-10 4.57671005e-10]
Centroid: [0.33331985 0.66665636 0.33333211]
x_new: [[0.33331873 0.66666334 0.33333331]]
fx_new [2.24173667e-10]
Back to top
————————
xs: [[0.3333245  0.66666145 0.3333287 ]
 [0.33331873 0.66666334 0.33333331]
 [0.33331533 0.66666531 0.33333253]
 [0.33332005 0.66665447 0.33332997]
 [0.33331703 0.66665928 0.33332744]
 [0.33332284 0.66665261 0.33334036]
 [0.33331823 0.66665203 0.33333488]]
fxs: [1.26639914e-10 2.24173667e-10 3.26565202e-10 3.36659712e-10
 3.55012701e-10 3.57092593e-10 4.44997784e-10]
Centroid: [0.33331953 0.66665836 0.33333246]
x_new: [[0.33332083 0.66666469 0.33333003]]
fx_new [1.71092882e-10]
Back to top
————————
xs: [[0.3333245  0.66666145 0.3333287 ]
 [0.33332083 0.66666469 0.33333003]
 [0.33331873 0.66666334 0.33333331]
 [0.33331533 0.66666531 0.33333253]
 [0.33332005 0.66665447 0.33332997]
 [0.33331703 0.66665928 0.33332744]
 [0.33332284 0.66665261 0.33334036]]
fxs: [1.26639914e-10 1.71092882e-10 2.24173667e-10 3.26565202e-10
 3.36659712e-10 3.55012701e-10 3.57092593e-10]
Centroid: [0.3333199  0.66666017 0.33333176]
x_new: [[0.33331697 0.66666772 0.33332317]]
fx_new [3.72297367e-10]
Contracting
————————
xs: [[0.3333245  0.66666145 0.3333287 ]
 [0.33332083 0.66666469 0.33333003]
 [0.33331873 0.66666334 0.33333331]
 [0.33332078 0.6666579  0.33333434]
 [0.33331533 0.66666531 0.33333253]
 [0.33332005 0.66665447 0.33332997]
 [0.33331703 0.66665928 0.33332744]]
fxs: [1.26639914e-10 1.71092882e-10 2.24173667e-10 2.35418007e-10
 3.26565202e-10 3.36659712e-10 3.55012701e-10]
Centroid: [0.33331961 0.66666092 0.3333309 ]
x_new: [[0.33332218 0.66666256 0.33333437]]
fx_new [1.42224155e-10]
Back to top
————————
xs: [[0.3333245  0.66666145 0.3333287 ]
 [0.33332218 0.66666256 0.33333437]
 [0.33332083 0.66666469 0.33333003]
 [0.33331873 0.66666334 0.33333331]
 [0.33332078 0.6666579  0.33333434]
 [0.33331533 0.66666531 0.33333253]
 [0.33332005 0.66665447 0.33332997]]
fxs: [1.26639914e-10 1.42224155e-10 1.71092882e-10 2.24173667e-10
```

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```
2.35418007e−10 3.26565202e−10 3.36659712e−10]
Centroid: [0.33332034 0.66666139 0.33333189]
x_new: [[0.33332064 0.66666831 0.33333382]]
fx_new [1.63971702e−10]
Back to top
————————————
xs: [[0.3333245  0.66666145 0.3333287 ]
 [0.33332218 0.66666256 0.33333437]
 [0.33332064 0.66666831 0.33333382]
 [0.33332083 0.66666469 0.33333003]
 [0.33331873 0.66666334 0.33333331]
 [0.33332078 0.6666579  0.33333434]
 [0.33331533 0.66666531 0.33333253]]
fxs: [1.26639914e−10 1.42224155e−10 1.63971702e−10 1.71092882e−10
 2.24173667e−10 2.35418007e−10 3.26565202e−10]
Centroid: [0.33332043 0.66666337 0.33333244]
x_new: [[0.33332553 0.66666142 0.33333235]]
fx_new [8.94134742e−11]
Expanding
————————————
xs: [[0.33333063 0.66665947 0.33333226]
 [0.3333245  0.66666145 0.3333287 ]
 [0.33332218 0.66666256 0.33333437]
 [0.33332064 0.66666831 0.33333382]
 [0.33332083 0.66666469 0.33333003]
 [0.33331873 0.66666334 0.33333331]
 [0.33332078 0.6666579  0.33333434]]
fxs: [6.02482439e−11 1.26639914e−10 1.42224155e−10 1.63971702e−10
 1.71092882e−10 2.24173667e−10 2.35418007e−10]
Centroid: [0.33332262 0.66666253 0.3333324 ]
x_new: [[0.33332445 0.66666716 0.33333047]]
fx_new [8.74157892e−11]
Back to top
————————————
xs: [[0.33333063 0.66665947 0.33333226]
 [0.33332445 0.66666716 0.33333047]
 [0.3333245  0.66666145 0.3333287 ]
 [0.33332218 0.66666256 0.33333437]
 [0.33332064 0.66666831 0.33333382]
 [0.33332083 0.66666469 0.33333003]
 [0.33331873 0.66666334 0.33333331]]
fxs: [6.02482439e−11 8.74157892e−11 1.26639914e−10 1.42224155e−10
 1.63971702e−10 1.71092882e−10 2.24173667e−10]
Centroid: [0.33332314 0.66666386 0.33333185]
x_new: [[0.33332754 0.66666437 0.33333039]]
fx_new [4.74462621e−11]
Expanding
————————————
xs: [[0.33333195 0.66666488 0.33332894]
 [0.33333063 0.66665947 0.33333226]
 [0.33332445 0.66666716 0.33333047]
 [0.3333245  0.66666145 0.3333287 ]
 [0.33332218 0.66666256 0.33333437]
 [0.33332064 0.66666831 0.33333382]
 [0.33332083 0.66666469 0.33333003]]
fxs: [2.44189051e−11 6.02482439e−11 8.74157892e−11 1.26639914e−10
 1.42224155e−10 1.63971702e−10 1.71092882e−10]
Centroid: [0.33332503 0.66666408 0.33333123]
x_new: [[0.33332922 0.66666346 0.33333242]]
fx_new [2.80135442e−11]
Back to top
————————————
xs: [[0.33333195 0.66666488 0.33332894]
 [0.33332922 0.66666346 0.33333242]
 [0.33333063 0.66665947 0.33333226]
 [0.33332445 0.66666716 0.33333047]
 [0.3333245  0.66666145 0.3333287 ]
 [0.33332218 0.66666256 0.33333437]
 [0.33332064 0.66666831 0.33333382]]
fxs: [2.44189051e−11 2.80135442e−11 6.02482439e−11 8.74157892e−11
```

```
  1.26639914e−10 1.42224155e−10 1.63971702e−10]
Centroid: [0.33332622 0.6666639  0.33333157]
x_new: [[0.33333181 0.66665949 0.33332932]]
fx_new [6.99391239e−11]
Back to top
————————
xs: [[0.33333195 0.66666488 0.33332894]
 [0.33332922 0.66666346 0.33333242]
 [0.33333063 0.66665947 0.33333226]
 [0.33333181 0.66665949 0.33332932]
 [0.33332445 0.66666716 0.33333047]
 [0.3333245  0.66666145 0.3333287 ]
 [0.33332218 0.66666256 0.33333437]]
fxs: [2.44189051e−11 2.80135442e−11 6.02482439e−11 6.99391239e−11
 8.74157892e−11 1.26639914e−10 1.42224155e−10]
Centroid: [0.33332782 0.66666264 0.33333093]
x_new: [[0.33333345 0.66666272 0.33332748]]
fx_new [4.98072396e−11]
Back to top
————————
xs: [[0.33333195 0.66666488 0.33332894]
 [0.33332922 0.66666346 0.33333242]
 [0.33333345 0.66666272 0.33332748]
 [0.33333063 0.66665947 0.33333226]
 [0.33333181 0.66665949 0.33332932]
 [0.33332445 0.66666716 0.33333047]
 [0.3333245  0.66666145 0.3333287 ]]
fxs: [2.44189051e−11 2.80135442e−11 4.98072396e−11 6.02482439e−11
 6.99391239e−11 8.74157892e−11 1.26639914e−10]
Centroid: [0.33332943 0.66666266 0.33332994]
x_new: [[0.33333436 0.66666388 0.33333118]]
fx_new [1.34796685e−11]
Expanding
————————
xs: [[0.33333436 0.66666388 0.33333118]
 [0.33333195 0.66666488 0.33332894]
 [0.33332922 0.66666346 0.33333242]
 [0.33333345 0.66666272 0.33332748]
 [0.33333063 0.66665947 0.33333226]
 [0.33333181 0.66665949 0.33332932]
 [0.33332445 0.66666716 0.33333047]]
fxs: [1.34796685e−11 2.44189051e−11 2.80135442e−11 4.98072396e−11
 6.02482439e−11 6.99391239e−11 8.74157892e−11]
Centroid: [0.33333084 0.66666301 0.3333303 ]
x_new: [[0.33333723 0.66665885 0.33333012]]
fx_new [8.64796128e−11]
Back to top
————————
xs: [[0.33333436 0.66666388 0.33333118]
 [0.33333195 0.66666488 0.33332894]
 [0.33332922 0.66666346 0.33333242]
 [0.33333345 0.66666272 0.33332748]
 [0.33333063 0.66665947 0.33333226]
 [0.33333181 0.66665949 0.33332932]
 [0.33333723 0.66665885 0.33333012]]
fxs: [1.34796685e−11 2.44189051e−11 2.80135442e−11 4.98072396e−11
 6.02482439e−11 6.99391239e−11 8.64796128e−11]
Centroid: [0.33333266 0.66666182 0.33333025]
x_new: [[0.3333281  0.66666479 0.33333037]]
fx_new [3.97076223e−11]
Back to top
————————
xs: [[0.33333436 0.66666388 0.33333118]
 [0.33333195 0.66666488 0.33332894]
 [0.33332922 0.66666346 0.33333242]
 [0.3333281  0.66666479 0.33333037]
 [0.33333345 0.66666272 0.33332748]
 [0.33333063 0.66665947 0.33333226]
 [0.33333181 0.66665949 0.33332932]]
fxs: [1.34796685e−11 2.44189051e−11 2.80135442e−11 3.97076223e−11
```

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```
  4.98072396e−11 6.02482439e−11 6.99391239e−11]
Centroid: [0.33333136 0.66666267 0.33333028]
x_new: [[0.33333091 0.66666585 0.33333125]]
fx_new [1.08896517e−11]
Expanding
—————————
xs: [[0.33333091 0.66666585 0.33333125]
 [0.33333436 0.66666388 0.33333118]
 [0.33333195 0.66666488 0.33332894]
 [0.33332922 0.66666346 0.33333242]
 [0.3333281  0.66666479 0.33333037]
 [0.33333345 0.66666272 0.33332748]
 [0.33333063 0.66665947 0.33333226]]
fxs: [1.08896517e−11 1.34796685e−11 2.44189051e−11 2.80135442e−11
 3.97076223e−11 4.98072396e−11 6.02482439e−11]
Centroid: [0.33333123 0.66666358 0.33333056]
x_new: [[0.33333183 0.66666769 0.33332885]]
fx_new [2.33452779e−11]
Back to top
—————————
xs: [[0.33333091 0.66666585 0.33333125]
 [0.33333436 0.66666388 0.33333118]
 [0.33333183 0.66666769 0.33332885]
 [0.33333195 0.66666488 0.33332894]
 [0.33332922 0.66666346 0.33333242]
 [0.3333281  0.66666479 0.33333037]
 [0.33333345 0.66666272 0.33332748]]
fxs: [1.08896517e−11 1.34796685e−11 2.33452779e−11 2.44189051e−11
 2.80135442e−11 3.97076223e−11 4.98072396e−11]
Centroid: [0.3333314  0.66666475 0.33333007]
x_new: [[0.33332935 0.66666678 0.33333266]]
fx_new [1.63171911e−11]
Back to top
—————————
xs: [[0.33333091 0.66666585 0.33333125]
 [0.33333436 0.66666388 0.33333118]
 [0.33332935 0.66666678 0.33333266]
 [0.33333183 0.66666769 0.33332885]
 [0.33333195 0.66666488 0.33332894]
 [0.33332922 0.66666346 0.33333242]
 [0.3333281  0.66666479 0.33333037]]
fxs: [1.08896517e−11 1.34796685e−11 1.63171911e−11 2.33452779e−11
 2.44189051e−11 2.80135442e−11 3.97076223e−11]
Centroid: [0.33333082 0.66666533 0.33333081]
x_new: [[0.33333354 0.66666588 0.33333125]]
fx_new [5.00397718e−12]
Expanding
—————————
xs: [[0.33333354 0.66666588 0.33333125]
 [0.33333091 0.66666585 0.33333125]
 [0.33333436 0.66666388 0.33333118]
 [0.33332935 0.66666678 0.33333266]
 [0.33333183 0.66666769 0.33332885]
 [0.33333195 0.66666488 0.33332894]
 [0.33332922 0.66666346 0.33333242]]
fxs: [5.00397718e−12 1.08896517e−11 1.34796685e−11 1.63171911e−11
 2.33452779e−11 2.44189051e−11 2.80135442e−11]
Centroid: [0.33333159 0.66666549 0.33333094]
x_new: [[0.33333397 0.66666751 0.33332945]]
fx_new [1.62096559e−11]
Back to top
—————————
xs: [[0.33333354 0.66666588 0.33333125]
 [0.33333091 0.66666585 0.33333125]
 [0.33333436 0.66666388 0.33333118]
 [0.33333397 0.66666751 0.33332945]
 [0.33332935 0.66666678 0.33333266]
 [0.33333183 0.66666769 0.33332885]
 [0.33333195 0.66666488 0.33332894]]
fxs: [5.00397718e−12 1.08896517e−11 1.34796685e−11 1.62096559e−11
```

```
  1.63171911e−11 2.33452779e−11 2.44189051e−11]
Centroid: [0.33333227 0.66666607 0.33333051]
x_new: [[0.3333326  0.66666725 0.33333208]]
fx_new [2.44578903e−12]
Expanding
————————————
xs: [[0.3333326  0.66666725 0.33333208]
 [0.33333354 0.66666588 0.33333125]
 [0.33333091 0.66666585 0.33333125]
 [0.33333436 0.66666388 0.33333118]
 [0.33333397 0.66666751 0.33332945]
 [0.33332935 0.66666678 0.33333266]
 [0.33333183 0.66666769 0.33332885]]
fxs: [2.44578903e−12 5.00397718e−12 1.08896517e−11 1.34796685e−11
 1.62096559e−11 1.63171911e−11 2.33452779e−11]
Centroid: [0.33333237 0.6666664  0.33333096]
x_new: [[0.3333329  0.66666512 0.33333307]]
fx_new [2.64449602e−12]
Back to top
————————————
xs: [[0.3333326  0.66666725 0.33333208]
 [0.3333329  0.66666512 0.33333307]
 [0.33333354 0.66666588 0.33333125]
 [0.33333091 0.66666585 0.33333125]
 [0.33333436 0.66666388 0.33333118]
 [0.33333397 0.66666751 0.33332945]
 [0.33332935 0.66666678 0.33333266]]
fxs: [2.44578903e−12 2.64449602e−12 5.00397718e−12 1.08896517e−11
 1.34796685e−11 1.62096559e−11 1.63171911e−11]
Centroid: [0.33333252 0.66666604 0.33333156]
x_new: [[0.33333568 0.66666529 0.33333047]]
fx_new [1.56268516e−11]
Back to top
————————————
xs: [[0.3333326  0.66666725 0.33333208]
 [0.3333329  0.66666512 0.33333307]
 [0.33333354 0.66666588 0.33333125]
 [0.33333091 0.66666585 0.33333125]
 [0.33333436 0.66666388 0.33333118]
 [0.33333568 0.66666529 0.33333047]
 [0.33333397 0.66666751 0.33332945]]
fxs: [2.44578903e−12 2.64449602e−12 5.00397718e−12 1.08896517e−11
 1.34796685e−11 1.56268516e−11 1.62096559e−11]
Centroid: [0.33333342 0.66666583 0.33333125]
x_new: [[0.33333287 0.66666414 0.33333305]]
fx_new [6.68325749e−12]
Back to top
————————————
xs: [[0.3333326  0.66666725 0.33333208]
 [0.3333329  0.66666512 0.33333307]
 [0.33333354 0.66666588 0.33333125]
 [0.33333287 0.66666414 0.33333305]
 [0.33333091 0.66666585 0.33333125]
 [0.33333436 0.66666388 0.33333118]
 [0.33333568 0.66666529 0.33333047]]
fxs: [2.44578903e−12 2.64449602e−12 5.00397718e−12 6.68325749e−12
 1.08896517e−11 1.34796685e−11 1.56268516e−11]
Centroid: [0.33333327 0.66666534 0.33333176]
x_new: [[0.33333085 0.66666539 0.33333306]]
fx_new [7.86923732e−12]
Back to top
————————————
xs: [[0.3333326  0.66666725 0.33333208]
 [0.3333329  0.66666512 0.33333307]
 [0.33333354 0.66666588 0.33333125]
 [0.33333287 0.66666414 0.33333305]
 [0.33333085 0.66666539 0.33333306]
 [0.33333091 0.66666585 0.33333125]
 [0.33333436 0.66666388 0.33333118]]
fxs: [2.44578903e−12 2.64449602e−12 5.00397718e−12 6.68325749e−12
```

```
     7.86923732e−12 1.08896517e−11 1.34796685e−11]
Centroid: [0.33333257 0.66666536 0.33333213]
x_new: [[0.33333079 0.66666684 0.33333309]]
fx_new [6.55064281e−12]
Back to top
————————
xs: [[0.3333326   0.66666725 0.33333208]
 [0.3333329   0.66666512 0.33333307]
 [0.33333354 0.66666588 0.33333125]
 [0.33333079 0.66666684 0.33333309]
 [0.33333287 0.66666414 0.33333305]
 [0.33333085 0.66666539 0.33333306]
 [0.33333091 0.66666585 0.33333125]]
fxs: [2.44578903e−12 2.64449602e−12 5.00397718e−12 6.55064281e−12
 6.68325749e−12 7.86923732e−12 1.08896517e−11]
Centroid: [0.33333207 0.66666578 0.33333241]
x_new: [[0.33333322 0.66666571 0.33333357]]
fx_new [9.7377986e−13]
Expanding
————————
xs: [[0.33333322 0.66666571 0.33333357]
 [0.3333326   0.66666725 0.33333208]
 [0.3333329   0.66666512 0.33333307]
 [0.33333354 0.66666588 0.33333125]
 [0.33333079 0.66666684 0.33333309]
 [0.33333287 0.66666414 0.33333305]
 [0.33333085 0.66666539 0.33333306]]
fxs: [9.73779860e−13 2.44578903e−12 2.64449602e−12 5.00397718e−12
 6.55064281e−12 6.68325749e−12 7.86923732e−12]
Centroid: [0.33333239 0.66666576 0.33333274]
x_new: [[0.33333394 0.66666613 0.33333241]]
fx_new [1.50106213e−12]
Back to top
————————
xs: [[0.33333322 0.66666571 0.33333357]
 [0.33333394 0.66666613 0.33333241]
 [0.3333326   0.66666725 0.33333208]
 [0.3333329   0.66666512 0.33333307]
 [0.33333354 0.66666588 0.33333125]
 [0.33333079 0.66666684 0.33333309]
 [0.33333287 0.66666414 0.33333305]]
fxs: [9.73779860e−13 1.50106213e−12 2.44578903e−12 2.64449602e−12
 5.00397718e−12 6.55064281e−12 6.68325749e−12]
Centroid: [0.33333284 0.66666587 0.33333264]
x_new: [[0.3333328   0.6666676   0.33333224]]
fx_new [2.34306012e−12]
Back to top
————————
xs: [[0.33333322 0.66666571 0.33333357]
 [0.33333394 0.66666613 0.33333241]
 [0.3333328   0.6666676   0.33333224]
 [0.3333326   0.66666725 0.33333208]
 [0.3333329   0.66666512 0.33333307]
 [0.33333354 0.66666588 0.33333125]
 [0.33333079 0.66666684 0.33333309]]
fxs: [9.73779860e−13 1.50106213e−12 2.34306012e−12 2.44578903e−12
 2.64449602e−12 5.00397718e−12 6.55064281e−12]
Centroid: [0.33333283 0.66666636 0.33333253]
x_new: [[0.33333486 0.66666588 0.33333197]]
fx_new [4.79689033e−12]
Back to top
————————
xs: [[0.33333322 0.66666571 0.33333357]
 [0.33333394 0.66666613 0.33333241]
 [0.3333328   0.6666676   0.33333224]
 [0.3333326   0.66666725 0.33333208]
 [0.3333329   0.66666512 0.33333307]
 [0.33333486 0.66666588 0.33333197]
 [0.33333354 0.66666588 0.33333125]]
fxs: [9.73779860e−13 1.50106213e−12 2.34306012e−12 2.44578903e−12
```

```
       2.64449602e−12 4.79689033e−12 5.00397718e−12]
Centroid: [0.33333341 0.66666622 0.33333237]
x_new: [[0.33333328 0.66666657 0.33333349]]
fx_new [3.60984056e−14]
Expanding
————————————
xs: [[0.33333328 0.66666657 0.33333349]
 [0.33333322 0.66666571 0.33333357]
 [0.33333394 0.66666613 0.33333241]
 [0.3333328  0.6666676  0.33333224]
 [0.3333326  0.66666725 0.33333208]
 [0.3333329  0.66666512 0.33333307]
 [0.33333486 0.66666588 0.33333197]]
fxs: [3.60984056e−14 9.73779860e−13 1.50106213e−12 2.34306012e−12
 2.44578903e−12 2.64449602e−12 4.79689033e−12]
Centroid: [0.33333337 0.66666632 0.33333269]
x_new: [[0.33333188 0.66666677 0.33333341]]
fx_new [2.12647142e−12]
Back to top
————————————
xs: [[0.33333328 0.66666657 0.33333349]
 [0.33333322 0.66666571 0.33333357]
 [0.33333394 0.66666613 0.33333241]
 [0.33333188 0.66666677 0.33333341]
 [0.3333328  0.6666676  0.33333224]
 [0.3333326  0.66666725 0.33333208]
 [0.3333329  0.66666512 0.33333307]]
fxs: [3.60984056e−14 9.73779860e−13 1.50106213e−12 2.12647142e−12
 2.34306012e−12 2.44578903e−12 2.64449602e−12]
Centroid: [0.33333294 0.66666645 0.3333329 ]
x_new: [[0.33333299 0.66666778 0.33333273]]
fx_new [1.72297665e−12]
Back to top
————————————
xs: [[0.33333328 0.66666657 0.33333349]
 [0.33333322 0.66666571 0.33333357]
 [0.33333394 0.66666613 0.33333241]
 [0.33333299 0.66666778 0.33333273]
 [0.33333188 0.66666677 0.33333341]
 [0.3333328  0.6666676  0.33333224]
 [0.3333326  0.66666725 0.33333208]]
fxs: [3.60984056e−14 9.73779860e−13 1.50106213e−12 1.72297665e−12
 2.12647142e−12 2.34306012e−12 2.44578903e−12]
Centroid: [0.33333296 0.66666683 0.33333285]
x_new: [[0.33333332 0.66666641 0.33333361]]
fx_new [1.43003488e−13]
Back to top
————————————
xs: [[0.33333328 0.66666657 0.33333349]
 [0.33333332 0.66666641 0.33333361]
 [0.33333322 0.66666571 0.33333357]
 [0.33333394 0.66666613 0.33333241]
 [0.33333299 0.66666778 0.33333273]
 [0.33333188 0.66666677 0.33333341]
 [0.3333328  0.6666676  0.33333224]]
fxs: [3.60984056e−14 1.43003488e−13 9.73779860e−13 1.50106213e−12
 1.72297665e−12 2.12647142e−12 2.34306012e−12]
Centroid: [0.33333306 0.66666671 0.33333307]
x_new: [[0.33333332 0.66666582 0.33333389]]
fx_new [1.01889038e−12]
Back to top
————————————
xs: [[0.33333328 0.66666657 0.33333349]
 [0.33333332 0.66666641 0.33333361]
 [0.33333322 0.66666571 0.33333357]
 [0.33333332 0.66666582 0.33333389]
 [0.33333394 0.66666613 0.33333241]
 [0.33333299 0.66666778 0.33333273]
 [0.33333188 0.66666677 0.33333341]]
fxs: [3.60984056e−14 1.43003488e−13 9.73779860e−13 1.01889038e−12
```

```
   1.50106213e-12 1.72297665e-12 2.12647142e-12]
Centroid: [0.33333314 0.66666646 0.3333333 ]
x_new: [[0.33333439 0.66666615 0.33333319]]
fx_new [1.4098983e-12]
Back to top
————————————
xs: [[0.33333328 0.66666657 0.33333349]
 [0.33333332 0.66666641 0.33333361]
 [0.33333322 0.66666571 0.33333357]
 [0.33333332 0.66666582 0.33333389]
 [0.33333439 0.66666615 0.33333319]
 [0.33333394 0.66666613 0.33333241]
 [0.33333299 0.66666778 0.33333273]]
fxs: [3.60984056e-14 1.43003488e-13 9.73779860e-13 1.01889038e-12
 1.40989830e-12 1.50106213e-12 1.72297665e-12]
Centroid: [0.33333349 0.66666637 0.33333327]
x_new: [[0.333334   0.66666496 0.33333381]]
fx_new [3.59092713e-12]
Contracting
————————————
xs: [[0.33333328 0.66666657 0.33333349]
 [0.33333334 0.66666679 0.33333311]
 [0.33333332 0.66666641 0.33333361]
 [0.33333322 0.66666571 0.33333357]
 [0.33333332 0.66666582 0.33333389]
 [0.33333439 0.66666615 0.33333319]
 [0.33333394 0.66666613 0.33333241]]
fxs: [3.60984056e-14 6.72361811e-14 1.43003488e-13 9.73779860e-13
 1.01889038e-12 1.40989830e-12 1.50106213e-12]
Centroid: [0.33333355 0.66666623 0.33333332]
x_new: [[0.33333315 0.66666632 0.33333423]]
fx_new [9.61990012e-13]
Back to top
————————————
xs: [[0.33333328 0.66666657 0.33333349]
 [0.33333334 0.66666679 0.33333311]
 [0.33333332 0.66666641 0.33333361]
 [0.33333315 0.66666632 0.33333423]
 [0.33333322 0.66666571 0.33333357]
 [0.33333332 0.66666582 0.33333389]
 [0.33333439 0.66666615 0.33333319]]
fxs: [3.60984056e-14 6.72361811e-14 1.43003488e-13 9.61990012e-13
 9.73779860e-13 1.01889038e-12 1.40989830e-12]
Centroid: [0.33333343 0.66666626 0.33333358]
x_new: [[0.33333247 0.66666636 0.33333398]]
fx_new [1.24583234e-12]
Back to top
————————————
xs: [[0.33333328 0.66666657 0.33333349]
 [0.33333334 0.66666679 0.33333311]
 [0.33333332 0.66666641 0.33333361]
 [0.33333315 0.66666632 0.33333423]
 [0.33333322 0.66666571 0.33333357]
 [0.33333332 0.66666582 0.33333389]
 [0.33333247 0.66666636 0.33333398]]
fxs: [3.60984056e-14 6.72361811e-14 1.43003488e-13 9.61990012e-13
 9.73779860e-13 1.01889038e-12 1.24583234e-12]
Centroid: [0.33333316 0.66666629 0.3333337 ]
x_new: [[0.33333384 0.66666621 0.33333342]]
fx_new [4.76521789e-13]
Back to top
————————————
xs: [[0.33333328 0.66666657 0.33333349]
 [0.33333334 0.66666679 0.33333311]
 [0.33333332 0.66666641 0.33333361]
 [0.33333384 0.66666621 0.33333342]
 [0.33333315 0.66666632 0.33333423]
 [0.33333322 0.66666571 0.33333357]
 [0.33333332 0.66666582 0.33333389]]
fxs: [3.60984056e-14 6.72361811e-14 1.43003488e-13 4.76521789e-13
```

```
 9.61990012e−13 9.73779860e−13 1.01889038e−12]
Centroid: [0.33333335 0.66666626 0.33333362]
x_new: [[0.33333338 0.6666667  0.33333334]]
fx_new [4.03975548e−15]
Expanding
————————
xs: [[0.33333338 0.6666667  0.33333334]
 [0.33333328 0.66666657 0.33333349]
 [0.33333334 0.66666679 0.33333311]
 [0.33333332 0.66666641 0.33333361]
 [0.33333384 0.66666621 0.33333342]
 [0.33333315 0.66666632 0.33333423]
 [0.33333322 0.66666571 0.33333357]]
fxs: [4.03975548e−15 3.60984056e−14 6.72361811e−14 1.43003488e−13
 4.76521789e−13 9.61990012e−13 9.73779860e−13]
Centroid: [0.33333336 0.66666639 0.33333354]
x_new: [[0.33333351 0.66666706 0.33333351]]
fx_new [2.19806647e−13]
Back to top
————————
xs: [[0.33333338 0.6666667  0.33333334]
 [0.33333328 0.66666657 0.33333349]
 [0.33333334 0.66666679 0.33333311]
 [0.33333332 0.66666641 0.33333361]
 [0.33333351 0.66666706 0.33333351]
 [0.33333384 0.66666621 0.33333342]
 [0.33333315 0.66666632 0.33333423]]
fxs: [4.03975548e−15 3.60984056e−14 6.72361811e−14 1.43003488e−13
 2.19806647e−13 4.76521789e−13 9.61990012e−13]
Centroid: [0.3333334  0.66666658 0.33333353]
x_new: [[0.33333366 0.66666684 0.33333283]]
fx_new [3.92359832e−13]
Back to top
————————
xs: [[0.33333338 0.6666667  0.33333334]
 [0.33333328 0.66666657 0.33333349]
 [0.33333334 0.66666679 0.33333311]
 [0.33333332 0.66666641 0.33333361]
 [0.33333351 0.66666706 0.33333351]
 [0.33333366 0.66666684 0.33333283]
 [0.33333384 0.66666621 0.33333342]]
fxs: [4.03975548e−15 3.60984056e−14 6.72361811e−14 1.43003488e−13
 2.19806647e−13 3.92359832e−13 4.76521789e−13]
Centroid: [0.33333348 0.66666666 0.33333333]
x_new: [[0.33333311 0.6666671  0.33333324]]
fx_new [2.5022234e−13]
Back to top
————————
xs: [[0.33333338 0.6666667  0.33333334]
 [0.33333328 0.66666657 0.33333349]
 [0.33333334 0.66666679 0.33333311]
 [0.33333332 0.66666641 0.33333361]
 [0.33333351 0.66666706 0.33333351]
 [0.33333311 0.6666671  0.33333324]
 [0.33333366 0.66666684 0.33333283]]
fxs: [4.03975548e−15 3.60984056e−14 6.72361811e−14 1.43003488e−13
 2.19806647e−13 2.50222340e−13 3.92359832e−13]
Centroid: [0.33333337 0.66666678 0.3333333 ]
x_new: [[0.33333308 0.66666673 0.33333378]]
fx_new [2.66869825e−13]
Back to top
————————
xs: [[0.33333338 0.6666667  0.33333334]
 [0.33333328 0.66666657 0.33333349]
 [0.33333334 0.66666679 0.33333311]
 [0.33333332 0.66666641 0.33333361]
 [0.33333351 0.66666706 0.33333351]
 [0.33333311 0.6666671  0.33333324]
 [0.33333308 0.66666673 0.33333378]]
fxs: [4.03975548e−15 3.60984056e−14 6.72361811e−14 1.43003488e−13
```

```
  2.19806647e−13 2.50222340e−13 2.66869825e−13]
Centroid: [0.33333329 0.66666677 0.33333344]
x_new: [[0.33333349 0.66666681 0.3333331 ]]
fx_new [1.00587117e−13]
Back to top
————————————
xs: [[0.33333338 0.6666667  0.33333334]
 [0.33333328 0.66666657 0.33333349]
 [0.33333334 0.66666679 0.33333311]
 [0.33333349 0.66666681 0.3333331 ]
 [0.33333332 0.66666641 0.33333361]
 [0.33333351 0.66666706 0.33333351]
 [0.33333311 0.6666671  0.33333324]]
fxs: [4.03975548e−15 3.60984056e−14 6.72361811e−14 1.00587117e−13
 1.43003488e−13 2.19806647e−13 2.50222340e−13]
Centroid: [0.33333335 0.66666678 0.33333334]
x_new: [[0.33333359 0.66666646 0.33333344]]
fx_new [1.21120076e−13]
Back to top
————————————
xs: [[0.33333338 0.6666667  0.33333334]
 [0.33333328 0.66666657 0.33333349]
 [0.33333334 0.66666679 0.33333311]
 [0.33333349 0.66666681 0.3333331 ]
 [0.33333359 0.66666646 0.33333344]
 [0.33333332 0.66666641 0.33333361]
 [0.33333351 0.66666706 0.33333351]]
fxs: [4.03975548e−15 3.60984056e−14 6.72361811e−14 1.00587117e−13
 1.21120076e−13 1.43003488e−13 2.19806647e−13]
Centroid: [0.33333342 0.66666669 0.33333337]
x_new: [[0.33333333 0.66666631 0.33333323]]
fx_new [1.37791482e−13]
Back to top
————————————
xs: [[0.33333338 0.6666667  0.33333334]
 [0.33333328 0.66666657 0.33333349]
 [0.33333334 0.66666679 0.33333311]
 [0.33333349 0.66666681 0.3333331 ]
 [0.33333359 0.66666646 0.33333344]
 [0.33333333 0.66666631 0.33333323]
 [0.33333332 0.66666641 0.33333361]]
fxs: [4.03975548e−15 3.60984056e−14 6.72361811e−14 1.00587117e−13
 1.21120076e−13 1.37791482e−13 1.43003488e−13]
Centroid: [0.33333339 0.66666658 0.33333333]
x_new: [[0.33333346 0.66666675 0.33333305]]
fx_new [1.0088249e−13]
Back to top
————————————
xs: [[0.33333338 0.6666667  0.33333334]
 [0.33333328 0.66666657 0.33333349]
 [0.33333334 0.66666679 0.33333311]
 [0.33333349 0.66666681 0.3333331 ]
 [0.33333346 0.66666675 0.33333305]
 [0.33333359 0.66666646 0.33333344]
 [0.33333333 0.66666631 0.33333323]]
fxs: [4.03975548e−15 3.60984056e−14 6.72361811e−14 1.00587117e−13
 1.00882490e−13 1.21120076e−13 1.37791482e−13]
Centroid: [0.33333341 0.66666663 0.33333325]
x_new: [[0.3333335  0.66666695 0.33333327]]
fx_new [1.07720424e−13]
Back to top
————————————
xs: [[0.33333338 0.6666667  0.33333334]
 [0.33333328 0.66666657 0.33333349]
 [0.33333334 0.66666679 0.33333311]
 [0.33333349 0.66666681 0.3333331 ]
 [0.33333346 0.66666675 0.33333305]
 [0.3333335  0.66666695 0.33333327]
 [0.33333359 0.66666646 0.33333344]]
fxs: [4.03975548e−15 3.60984056e−14 6.72361811e−14 1.00587117e−13
```

```
1.00882490e−13 1.07720424e−13 1.21120076e−13]
Centroid: [0.33333343 0.66666672 0.33333326]
x_new: [[0.33333328 0.66666698 0.33333307]]
fx_new [1.69335975e−13]
Contracting
——————————
xs: [[0.33333338 0.6666667  0.33333334]
 [0.33333348 0.66666664 0.33333331]
 [0.33333328 0.66666657 0.33333349]
 [0.33333334 0.66666679 0.33333311]
 [0.33333349 0.66666681 0.3333331 ]
 [0.33333346 0.66666675 0.33333305]
 [0.3333335  0.66666695 0.33333327]]
fxs: [4.03975548e−15 2.26997929e−14 3.60984056e−14 6.72361811e−14
 1.00587117e−13 1.00882490e−13 1.07720424e−13]
Centroid: [0.33333342 0.66666674 0.33333324]
x_new: [[0.33333334 0.66666654 0.33333321]]
fx_new [3.10649733e−14]
Back to top
——————————
xs: [[0.33333338 0.6666667  0.33333334]
 [0.33333348 0.66666664 0.33333331]
 [0.33333334 0.66666654 0.33333321]
 [0.33333328 0.66666657 0.33333349]
 [0.33333334 0.66666679 0.33333311]
 [0.33333349 0.66666681 0.3333331 ]
 [0.33333346 0.66666675 0.33333305]]
fxs: [4.03975548e−15 2.26997929e−14 3.10649733e−14 3.60984056e−14
 6.72361811e−14 1.00587117e−13 1.00882490e−13]
Centroid: [0.3333334  0.66666669 0.33333323]
x_new: [[0.33333333 0.66666663 0.33333341]]
fx_new [7.08954618e−15]
Back to top
——————————
xs: [[0.33333338 0.6666667  0.33333334]
 [0.33333333 0.66666663 0.33333341]
 [0.33333348 0.66666664 0.33333331]
 [0.33333334 0.66666654 0.33333321]
 [0.33333328 0.66666657 0.33333349]
 [0.33333334 0.66666679 0.33333311]
 [0.33333349 0.66666681 0.3333331 ]]
fxs: [4.03975548e−15 7.08954618e−15 2.26997929e−14 3.10649733e−14
 3.60984056e−14 6.72361811e−14 1.00587117e−13]
Centroid: [0.33333338 0.66666667 0.33333328]
x_new: [[0.33333327 0.66666653 0.33333346]]
fx_new [3.98116969e−14]
Back to top
——————————
xs: [[0.33333338 0.6666667  0.33333334]
 [0.33333333 0.66666663 0.33333341]
 [0.33333348 0.66666664 0.33333331]
 [0.33333334 0.66666654 0.33333321]
 [0.33333328 0.66666657 0.33333349]
 [0.33333327 0.66666653 0.33333346]
 [0.33333334 0.66666679 0.33333311]]
fxs: [4.03975548e−15 7.08954618e−15 2.26997929e−14 3.10649733e−14
 3.60984056e−14 3.98116969e−14 6.72361811e−14]
Centroid: [0.33333335 0.66666663 0.33333333]
x_new: [[0.33333335 0.66666647 0.33333356]]
fx_new [9.08736176e−14]
Contracting
——————————
xs: [[0.33333338 0.6666667  0.33333334]
 [0.33333335 0.66666668 0.33333327]
 [0.33333333 0.66666663 0.33333341]
 [0.33333348 0.66666664 0.33333331]
 [0.33333334 0.66666654 0.33333321]
 [0.33333328 0.66666657 0.33333349]
 [0.33333327 0.66666653 0.33333346]]
fxs: [4.03975548e−15 4.96403640e−15 7.08954618e−15 2.26997929e−14
```

```
   3.10649733e−14 3.60984056e−14 3.98116969e−14]
Centroid: [0.33333335 0.66666661 0.33333336]
x_new: [[0.33333343 0.6666667  0.33333325]]
fx_new [1.72819609e−14]
Back to top
Found minimum after 614 iterations
```

NR_a1_3_main.txt