springs-with-pictures

April 5, 2023

0.0.1 An engineering problem from "Engineering Optimization" by Xin-She Yang

Goal: Design an optimal spring (cheapest / least material needed) that does the job. Parameters we can change: d, the diameter of the coil; L, the length of the spring; w, the thickness of the wire.

Task: Minimize
$$(2 + L)dw^2$$

subject to the constraints

$$g_1(L, d, w) = 1 - \frac{d^3 L}{7178 w^4} \leq 0$$

$$g_2(L, d, w) = \frac{4d^2 - wd}{12566 dw^3 - w^4} + \frac{1}{5108 w^2} - 1 \leq 0$$

$$g_3(L, d, w) = 1 - \frac{140.45 w}{d^2 L} \leq 0$$

$$g_4(L, d, w) = \frac{w + d}{1.5} - 1 \leq 0$$

with boundary conditions

$$0.05 \leq w \leq 2.0 \qquad 0.25 \leq d \leq 1.3 \qquad 2.0 \leq L \leq 15.0$$

```
[64]: import math
      import random
```

```
[65]: def random_in_range(lower, upper):
          return random.random() * (upper - lower) + lower
      random_in_range(2, 15)
```

```
[65]: 9.807272192879124
```

```
[66]: def g1(L,d,w):
          return 1 - d**3 * L / (7178 * w**4)

      def g2(L,d,w):
          return (4*d**2 - w*d)/(12566 * d * w**3 - w**4) + 1/(5108*w**2) - 1

      def g3(L,d,w):
          return 1 - 140.45 * w / (d**2*L)
```

```python
def g4(L,d,w):
    return (w+d)/1.5 - 1

def satisfies_constraints(L,d,w):
    return g1(L,d,w) <= 0 and g2(L,d,w) <= 0 and g3(L,d,w) <= 0 and g4(L,d,w)↵
    ↳<= 0
```

```python
[67]: def score(L,d,w):  # w-squared is "w**2" not "w^2"
          return (2+L)*d*w**2
```

```python
[68]: def tweak(L,d,w):
          delta_w = 0.01
          delta_d = 0.01
          delta_L = 0.1

          new_w = w + random_in_range(-1, 1) * delta_w
          while new_w < 0.05 or new_w > 2:
              new_w = w + random_in_range(-1, 1) * delta_w

          new_d = d + random_in_range(-1, 1) * delta_d
          while new_d < 0.25 or new_d > 1.3:
              new_d = d + random_in_range(-1, 1) * delta_d

          new_L = L + random_in_range(-1, 1) * delta_L
          while new_L < 2 or new_L > 15:
              new_L = L + random_in_range(-1, 1) * delta_L

          return (new_L, new_d, new_w)

      tweak(15, 1.3, 2.0)
```

```
[68]: (14.985475559511695, 1.2953884226171417, 1.9955223584629296)
```

```python
[69]: def random_solution():
          return (
              random_in_range(2, 15),
              random_in_range(0.25, 1.3),
              random_in_range(0.05, 2),
          )
      print(random_solution())
```

```
(14.670093262180803, 1.0832237814826102, 1.7099436217865769)
```

```python
[70]: # what does the * do
      def test(num1, num2):
          return num1 + num2
      L = [1,3]
```

```
    test(*L)
```

[70]: 4

[ ]:

[88]:
```
%matplotlib notebook

from mpl_toolkits.mplot3d import Axes3D
import numpy as np
import matplotlib.pyplot as plt
from IPython.display import clear_output
from math import sqrt, pi

def show_spring(L,d,w):

    ax.lines.clear()

    N = L

    theta = np.linspace(0, N * 2 * np.pi, 1000)
    z = theta/2/np.pi
    x = d * np.sin(theta)
    y = d* np.cos(theta)
    line = ax.plot(x, y, z, color='b', label='parametric curve', lw=w*30) # the
 ↪full spiral

    fig.canvas.draw()
```

[ ]:

[89]:
```
def hill_climbing():

    start = random_solution()
    while not satisfies_constraints(*start):
        start = random_solution()
    sol = start
    value = score(*sol)

    bad = 0
    while True:
        new_sol = tweak(*sol)
        while not satisfies_constraints(*new_sol):
            new_sol = tweak(*sol)
        new_value = score(*new_sol)
        if new_value < value:
            bad = 0
```

```
                sol = new_sol
                value = new_value
                # uncomment the two lines below to show the picture
                # you may need to install the matplotlib library with "pip"
                #clear_output(wait=True)
                show_spring(*sol)

        else:
            bad += 1
            if bad > 1000:
                print(value)
                return sol
```

[91]:
```
fig = plt.figure()
ax = fig.add_subplot(projection='3d')
ax.set_xlim([-2,2])
ax.set_ylim([-2,2])
ax.set_zlim([0,15])
```

<IPython.core.display.Javascript object>

<IPython.core.display.HTML object>

[91]: (0.0, 15.0)

[92]:
```
sol = hill_climbing()
#sol = [2.02310938, 0.25113418, 0.05218225]
# L, d, w
print(sol)
print(g1(*sol), g2(*sol), g3(*sol), g4(*sol))
print(score(*sol))
```

0.005705351240616958
(7.098900267453348, 0.25039481054259344, 0.05004193319537656)
-1.4758668051898272 -0.31754930467321973 -14.791162396696972 -0.79970883750802
0.005705351240616958

[93]:
```
old_sol = [2.02310938, 0.25113418, 0.05218225]
score(*old_sol)
```

[93]: 0.0027511436522230925

[94]:
```
fig = plt.figure()
ax = fig.add_subplot(projection='3d')
ax.set_xlim([-2,2])
ax.set_ylim([-2,2])
ax.set_zlim([0,15])
```

<IPython.core.display.Javascript object>

```
<IPython.core.display.HTML object>
```

[94]: `(0.0, 15.0)`

[95]:
```python
# smarter: sample 1000 tweaks to find a good initial_temp that gives a desired␣
 ↪p_0
# or: heat the system slowly until the % of worsening solutions is what you want
initial_temp = 0.005
alpha = 0.99
final_temp = initial_temp / 1000
trials_per_temp = 10000

start = random_solution()
while not satisfies_constraints(*start):
    start = random_solution()
sol = start
value = score(*sol)
```

[96]:
```python
temp = initial_temp
generation = 0
best_sol = None
best_score = None

while temp >= final_temp:
    generation += 1
    accepted_worse = 0
    total_worse = 0
    for i in range(trials_per_temp):
        new_sol = tweak(*sol)
        while not satisfies_constraints(*new_sol):
            new_sol = tweak(*sol)

        new_value = score(*new_sol)

        delta = new_value - value
        delta *= -1
        if delta >= 0:
            sol = new_sol
            value = new_value
            if best_score is None or value < best_score:
                best_sol = sol
                best_score = value
        else:
            total_worse += 1
            p = math.exp(delta/temp)
            r = random.random()
            if r <= p:
```

```python
                accepted_worse += 1
                sol = new_sol
                value = new_value

    from time import sleep

    print(
        f"Gen #{generation}: temp = {temp:.6f}, "
        f"best score = {best_score:.8f}, "
        f"cur score = {value:.8f}, "
        f"worse accepted = {round(accepted_worse/total_worse*100,2):.2f}%"
    )
    show_spring(*sol)
    temp = temp * alpha
```

Gen #1: temp = 0.005000, best score = 0.00404371, cur score = 0.01572119, worse
accepted = 60.35%
Gen #2: temp = 0.004950, best score = 0.00382933, cur score = 0.00629683, worse
accepted = 70.82%
Gen #3: temp = 0.004901, best score = 0.00288862, cur score = 0.00792778, worse
accepted = 74.98%
Gen #4: temp = 0.004851, best score = 0.00288862, cur score = 0.02771449, worse
accepted = 78.23%
Gen #5: temp = 0.004803, best score = 0.00288862, cur score = 0.00659589, worse
accepted = 72.37%
Gen #6: temp = 0.004755, best score = 0.00288862, cur score = 0.01530292, worse
accepted = 70.24%
Gen #7: temp = 0.004707, best score = 0.00288862, cur score = 0.00711256, worse
accepted = 73.07%
Gen #8: temp = 0.004660, best score = 0.00288862, cur score = 0.00735983, worse
accepted = 79.21%
Gen #9: temp = 0.004614, best score = 0.00288862, cur score = 0.01013316, worse
accepted = 73.75%
Gen #10: temp = 0.004568, best score = 0.00288862, cur score = 0.02445420, worse
accepted = 72.07%
Gen #11: temp = 0.004522, best score = 0.00288862, cur score = 0.01515874, worse
accepted = 66.27%
Gen #12: temp = 0.004477, best score = 0.00288862, cur score = 0.00703637, worse
accepted = 69.79%
Gen #13: temp = 0.004432, best score = 0.00288862, cur score = 0.02253316, worse
accepted = 71.80%
Gen #14: temp = 0.004388, best score = 0.00288862, cur score = 0.00855754, worse
accepted = 60.67%
Gen #15: temp = 0.004344, best score = 0.00288862, cur score = 0.01279164, worse
accepted = 72.08%
Gen #16: temp = 0.004300, best score = 0.00288862, cur score = 0.00605952, worse
accepted = 72.89%

```
Gen #17: temp = 0.004257, best score = 0.00288862, cur score = 0.00828631, worse
accepted = 71.94%
Gen #18: temp = 0.004215, best score = 0.00288862, cur score = 0.01267901, worse
accepted = 69.54%
Gen #19: temp = 0.004173, best score = 0.00288862, cur score = 0.00830415, worse
accepted = 74.31%
Gen #20: temp = 0.004131, best score = 0.00288862, cur score = 0.00615264, worse
accepted = 74.20%
Gen #21: temp = 0.004090, best score = 0.00288862, cur score = 0.00726560, worse
accepted = 76.17%
Gen #22: temp = 0.004049, best score = 0.00288862, cur score = 0.00736412, worse
accepted = 75.28%
Gen #23: temp = 0.004008, best score = 0.00288862, cur score = 0.00517212, worse
accepted = 71.34%
Gen #24: temp = 0.003968, best score = 0.00288862, cur score = 0.00763432, worse
accepted = 67.38%
Gen #25: temp = 0.003928, best score = 0.00288862, cur score = 0.01245083, worse
accepted = 63.78%
Gen #26: temp = 0.003889, best score = 0.00288862, cur score = 0.01028654, worse
accepted = 67.99%
Gen #27: temp = 0.003850, best score = 0.00288862, cur score = 0.01357945, worse
accepted = 71.05%
Gen #28: temp = 0.003812, best score = 0.00288862, cur score = 0.00903622, worse
accepted = 66.40%
Gen #29: temp = 0.003774, best score = 0.00288862, cur score = 0.00732460, worse
accepted = 66.87%
Gen #30: temp = 0.003736, best score = 0.00288862, cur score = 0.00974951, worse
accepted = 60.47%
Gen #31: temp = 0.003699, best score = 0.00288862, cur score = 0.00815788, worse
accepted = 58.09%
Gen #32: temp = 0.003662, best score = 0.00288862, cur score = 0.01276737, worse
accepted = 69.46%
Gen #33: temp = 0.003625, best score = 0.00288862, cur score = 0.00945547, worse
accepted = 67.93%
Gen #34: temp = 0.003589, best score = 0.00288862, cur score = 0.01273774, worse
accepted = 56.81%
Gen #35: temp = 0.003553, best score = 0.00288862, cur score = 0.01247933, worse
accepted = 61.38%
Gen #36: temp = 0.003517, best score = 0.00288862, cur score = 0.00988512, worse
accepted = 56.70%
Gen #37: temp = 0.003482, best score = 0.00288862, cur score = 0.00924378, worse
accepted = 60.51%
Gen #38: temp = 0.003447, best score = 0.00288862, cur score = 0.01206847, worse
accepted = 72.74%
Gen #39: temp = 0.003413, best score = 0.00288862, cur score = 0.00663452, worse
accepted = 63.85%
Gen #40: temp = 0.003379, best score = 0.00288862, cur score = 0.00758196, worse
accepted = 72.56%
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```
Gen #41: temp = 0.003345, best score = 0.00288862, cur score = 0.01409410, worse
accepted = 59.48%
Gen #42: temp = 0.003311, best score = 0.00288862, cur score = 0.01103544, worse
accepted = 59.31%
Gen #43: temp = 0.003278, best score = 0.00288862, cur score = 0.01842254, worse
accepted = 70.97%
Gen #44: temp = 0.003246, best score = 0.00288862, cur score = 0.01255661, worse
accepted = 66.90%
Gen #45: temp = 0.003213, best score = 0.00288862, cur score = 0.01265876, worse
accepted = 67.45%
Gen #46: temp = 0.003181, best score = 0.00288862, cur score = 0.01530154, worse
accepted = 65.08%
Gen #47: temp = 0.003149, best score = 0.00288862, cur score = 0.00986943, worse
accepted = 58.29%
Gen #48: temp = 0.003118, best score = 0.00288862, cur score = 0.01318424, worse
accepted = 56.89%
Gen #49: temp = 0.003086, best score = 0.00288862, cur score = 0.00733520, worse
accepted = 55.34%
Gen #50: temp = 0.003056, best score = 0.00288862, cur score = 0.01084345, worse
accepted = 68.20%
Gen #51: temp = 0.003025, best score = 0.00288862, cur score = 0.01014182, worse
accepted = 65.24%
Gen #52: temp = 0.002995, best score = 0.00288862, cur score = 0.00937299, worse
accepted = 62.25%
Gen #53: temp = 0.002965, best score = 0.00288862, cur score = 0.01195218, worse
accepted = 62.30%
Gen #54: temp = 0.002935, best score = 0.00288862, cur score = 0.00842464, worse
accepted = 61.00%
Gen #55: temp = 0.002906, best score = 0.00288862, cur score = 0.01146926, worse
accepted = 61.86%
Gen #56: temp = 0.002877, best score = 0.00288862, cur score = 0.00663070, worse
accepted = 66.86%
Gen #57: temp = 0.002848, best score = 0.00288862, cur score = 0.00765443, worse
accepted = 67.34%
Gen #58: temp = 0.002820, best score = 0.00288862, cur score = 0.00545406, worse
accepted = 67.58%
Gen #59: temp = 0.002791, best score = 0.00288862, cur score = 0.00779029, worse
accepted = 69.79%
Gen #60: temp = 0.002763, best score = 0.00288862, cur score = 0.01090499, worse
accepted = 68.66%
Gen #61: temp = 0.002736, best score = 0.00288862, cur score = 0.00668608, worse
accepted = 68.51%
Gen #62: temp = 0.002708, best score = 0.00288862, cur score = 0.00559034, worse
accepted = 68.29%
Gen #63: temp = 0.002681, best score = 0.00288862, cur score = 0.00926365, worse
accepted = 63.17%
Gen #64: temp = 0.002655, best score = 0.00288862, cur score = 0.00827043, worse
accepted = 61.55%
```

```
Gen #65: temp = 0.002628, best score = 0.00288862, cur score = 0.00819504, worse
accepted = 61.61%
Gen #66: temp = 0.002602, best score = 0.00288862, cur score = 0.00658211, worse
accepted = 67.49%
Gen #67: temp = 0.002576, best score = 0.00288862, cur score = 0.00739826, worse
accepted = 60.04%
Gen #68: temp = 0.002550, best score = 0.00288862, cur score = 0.00597491, worse
accepted = 56.93%
Gen #69: temp = 0.002524, best score = 0.00288862, cur score = 0.00659928, worse
accepted = 66.74%
Gen #70: temp = 0.002499, best score = 0.00288862, cur score = 0.00544861, worse
accepted = 64.92%
Gen #71: temp = 0.002474, best score = 0.00288862, cur score = 0.00488268, worse
accepted = 65.57%
Gen #72: temp = 0.002449, best score = 0.00288862, cur score = 0.01055675, worse
accepted = 69.33%
Gen #73: temp = 0.002425, best score = 0.00288862, cur score = 0.00552146, worse
accepted = 61.43%
Gen #74: temp = 0.002401, best score = 0.00288862, cur score = 0.00617505, worse
accepted = 62.41%
Gen #75: temp = 0.002377, best score = 0.00288862, cur score = 0.01405412, worse
accepted = 65.79%
Gen #76: temp = 0.002353, best score = 0.00288862, cur score = 0.00470525, worse
accepted = 63.36%
Gen #77: temp = 0.002329, best score = 0.00288862, cur score = 0.00679226, worse
accepted = 65.97%
Gen #78: temp = 0.002306, best score = 0.00288862, cur score = 0.00988765, worse
accepted = 57.68%
Gen #79: temp = 0.002283, best score = 0.00288862, cur score = 0.00825986, worse
accepted = 51.70%
Gen #80: temp = 0.002260, best score = 0.00288862, cur score = 0.00542399, worse
accepted = 55.86%
Gen #81: temp = 0.002238, best score = 0.00288862, cur score = 0.00593180, worse
accepted = 63.91%
Gen #82: temp = 0.002215, best score = 0.00288862, cur score = 0.00535538, worse
accepted = 65.83%
Gen #83: temp = 0.002193, best score = 0.00288862, cur score = 0.00854356, worse
accepted = 61.65%
Gen #84: temp = 0.002171, best score = 0.00288862, cur score = 0.00473560, worse
accepted = 67.39%
Gen #85: temp = 0.002149, best score = 0.00288862, cur score = 0.00721722, worse
accepted = 62.18%
Gen #86: temp = 0.002128, best score = 0.00288862, cur score = 0.00621694, worse
accepted = 62.70%
Gen #87: temp = 0.002107, best score = 0.00288862, cur score = 0.00958849, worse
accepted = 54.16%
Gen #88: temp = 0.002086, best score = 0.00288862, cur score = 0.00689070, worse
accepted = 44.03%
```

Gen #89: temp = 0.002065, best score = 0.00288862, cur score = 0.00991505, worse accepted = 58.17%
Gen #90: temp = 0.002044, best score = 0.00288862, cur score = 0.01193382, worse accepted = 56.39%
Gen #91: temp = 0.002024, best score = 0.00288862, cur score = 0.00937963, worse accepted = 59.77%
Gen #92: temp = 0.002003, best score = 0.00288862, cur score = 0.00751761, worse accepted = 60.86%
Gen #93: temp = 0.001983, best score = 0.00288862, cur score = 0.00760765, worse accepted = 67.17%
Gen #94: temp = 0.001964, best score = 0.00288862, cur score = 0.00668656, worse accepted = 65.96%
Gen #95: temp = 0.001944, best score = 0.00288862, cur score = 0.00553401, worse accepted = 55.51%
Gen #96: temp = 0.001924, best score = 0.00288862, cur score = 0.00806455, worse accepted = 54.74%
Gen #97: temp = 0.001905, best score = 0.00288862, cur score = 0.00668235, worse accepted = 55.23%
Gen #98: temp = 0.001886, best score = 0.00288862, cur score = 0.00743364, worse accepted = 59.89%
Gen #99: temp = 0.001867, best score = 0.00288862, cur score = 0.00613125, worse accepted = 59.08%
Gen #100: temp = 0.001849, best score = 0.00288862, cur score = 0.00391338, worse accepted = 62.96%
Gen #101: temp = 0.001830, best score = 0.00288862, cur score = 0.00735162, worse accepted = 55.69%
Gen #102: temp = 0.001812, best score = 0.00288862, cur score = 0.00584810, worse accepted = 61.01%
Gen #103: temp = 0.001794, best score = 0.00288862, cur score = 0.00665027, worse accepted = 50.93%
Gen #104: temp = 0.001776, best score = 0.00288862, cur score = 0.00546471, worse accepted = 60.69%
Gen #105: temp = 0.001758, best score = 0.00288862, cur score = 0.00580071, worse accepted = 61.08%
Gen #106: temp = 0.001740, best score = 0.00288862, cur score = 0.00738834, worse accepted = 59.21%
Gen #107: temp = 0.001723, best score = 0.00288862, cur score = 0.01050966, worse accepted = 58.82%
Gen #108: temp = 0.001706, best score = 0.00288862, cur score = 0.00704206, worse accepted = 57.31%
Gen #109: temp = 0.001689, best score = 0.00288862, cur score = 0.00429824, worse accepted = 49.99%
Gen #110: temp = 0.001672, best score = 0.00288862, cur score = 0.00600214, worse accepted = 59.26%
Gen #111: temp = 0.001655, best score = 0.00288862, cur score = 0.00805456, worse accepted = 59.12%
Gen #112: temp = 0.001639, best score = 0.00288862, cur score = 0.00541787, worse accepted = 61.10%

```
Gen #113: temp = 0.001622, best score = 0.00288862, cur score = 0.00648010,
worse accepted = 59.43%
Gen #114: temp = 0.001606, best score = 0.00288862, cur score = 0.00822246,
worse accepted = 58.41%
Gen #115: temp = 0.001590, best score = 0.00288862, cur score = 0.00475298,
worse accepted = 53.94%
Gen #116: temp = 0.001574, best score = 0.00288862, cur score = 0.00785653,
worse accepted = 59.76%
Gen #117: temp = 0.001558, best score = 0.00288862, cur score = 0.00615271,
worse accepted = 63.39%
Gen #118: temp = 0.001543, best score = 0.00288862, cur score = 0.00488927,
worse accepted = 55.28%
Gen #119: temp = 0.001527, best score = 0.00288862, cur score = 0.00684641,
worse accepted = 51.01%
Gen #120: temp = 0.001512, best score = 0.00288862, cur score = 0.00365407,
worse accepted = 57.50%
Gen #121: temp = 0.001497, best score = 0.00288862, cur score = 0.00462559,
worse accepted = 57.92%
Gen #122: temp = 0.001482, best score = 0.00288862, cur score = 0.00750476,
worse accepted = 56.67%
Gen #123: temp = 0.001467, best score = 0.00288862, cur score = 0.00887437,
worse accepted = 52.73%
Gen #124: temp = 0.001452, best score = 0.00288862, cur score = 0.00628679,
worse accepted = 44.44%
Gen #125: temp = 0.001438, best score = 0.00288862, cur score = 0.00432145,
worse accepted = 55.88%
Gen #126: temp = 0.001424, best score = 0.00288862, cur score = 0.00597694,
worse accepted = 58.66%
Gen #127: temp = 0.001409, best score = 0.00288862, cur score = 0.00803972,
worse accepted = 54.08%
Gen #128: temp = 0.001395, best score = 0.00288862, cur score = 0.00768141,
worse accepted = 50.43%
Gen #129: temp = 0.001381, best score = 0.00288862, cur score = 0.00945495,
worse accepted = 57.51%
Gen #130: temp = 0.001367, best score = 0.00288862, cur score = 0.00826189,
worse accepted = 51.03%
Gen #131: temp = 0.001354, best score = 0.00288862, cur score = 0.00498212,
worse accepted = 48.82%
Gen #132: temp = 0.001340, best score = 0.00288862, cur score = 0.00608966,
worse accepted = 51.24%
Gen #133: temp = 0.001327, best score = 0.00288862, cur score = 0.00602250,
worse accepted = 42.08%
Gen #134: temp = 0.001314, best score = 0.00288862, cur score = 0.00581256,
worse accepted = 51.28%
Gen #135: temp = 0.001300, best score = 0.00288862, cur score = 0.00660896,
worse accepted = 39.85%
Gen #136: temp = 0.001287, best score = 0.00288862, cur score = 0.00576637,
worse accepted = 49.55%
```

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Gen #137: temp = 0.001275, best score = 0.00288862, cur score = 0.00460224,
worse accepted = 50.81%
Gen #138: temp = 0.001262, best score = 0.00288862, cur score = 0.00349704,
worse accepted = 52.50%
Gen #139: temp = 0.001249, best score = 0.00288862, cur score = 0.00885437,
worse accepted = 52.26%
Gen #140: temp = 0.001237, best score = 0.00288862, cur score = 0.00479189,
worse accepted = 54.72%
Gen #141: temp = 0.001224, best score = 0.00288862, cur score = 0.00339962,
worse accepted = 46.40%
Gen #142: temp = 0.001212, best score = 0.00288862, cur score = 0.00788543,
worse accepted = 49.50%
Gen #143: temp = 0.001200, best score = 0.00285724, cur score = 0.00882200,
worse accepted = 50.17%
Gen #144: temp = 0.001188, best score = 0.00285724, cur score = 0.00575939,
worse accepted = 55.12%
Gen #145: temp = 0.001176, best score = 0.00285724, cur score = 0.00544883,
worse accepted = 55.41%
Gen #146: temp = 0.001164, best score = 0.00285724, cur score = 0.00630181,
worse accepted = 52.01%
Gen #147: temp = 0.001153, best score = 0.00285724, cur score = 0.00557726,
worse accepted = 52.80%
Gen #148: temp = 0.001141, best score = 0.00285724, cur score = 0.00400743,
worse accepted = 51.95%
Gen #149: temp = 0.001130, best score = 0.00285724, cur score = 0.00393338,
worse accepted = 52.05%
Gen #150: temp = 0.001118, best score = 0.00285724, cur score = 0.00713309,
worse accepted = 45.99%
Gen #151: temp = 0.001107, best score = 0.00285724, cur score = 0.00671624,
worse accepted = 42.97%
Gen #152: temp = 0.001096, best score = 0.00285724, cur score = 0.00487311,
worse accepted = 55.92%
Gen #153: temp = 0.001085, best score = 0.00285724, cur score = 0.00459227,
worse accepted = 54.29%
Gen #154: temp = 0.001074, best score = 0.00285724, cur score = 0.00449852,
worse accepted = 53.16%
Gen #155: temp = 0.001064, best score = 0.00285724, cur score = 0.00537042,
worse accepted = 51.28%
Gen #156: temp = 0.001053, best score = 0.00285724, cur score = 0.00312023,
worse accepted = 41.00%
Gen #157: temp = 0.001042, best score = 0.00285724, cur score = 0.00463100,
worse accepted = 54.59%
Gen #158: temp = 0.001032, best score = 0.00285724, cur score = 0.00522111,
worse accepted = 47.18%
Gen #159: temp = 0.001022, best score = 0.00285724, cur score = 0.00645312,
worse accepted = 52.25%
Gen #160: temp = 0.001012, best score = 0.00285724, cur score = 0.00447106,
worse accepted = 46.44%
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Gen #161: temp = 0.001001, best score = 0.00285724, cur score = 0.00500394,
worse accepted = 41.94%
Gen #162: temp = 0.000991, best score = 0.00285724, cur score = 0.00585738,
worse accepted = 52.12%
Gen #163: temp = 0.000981, best score = 0.00285724, cur score = 0.00546135,
worse accepted = 50.34%
Gen #164: temp = 0.000972, best score = 0.00285724, cur score = 0.00844171,
worse accepted = 52.38%
Gen #165: temp = 0.000962, best score = 0.00285724, cur score = 0.00648072,
worse accepted = 37.02%
Gen #166: temp = 0.000952, best score = 0.00285724, cur score = 0.00378781,
worse accepted = 54.20%
Gen #167: temp = 0.000943, best score = 0.00285724, cur score = 0.00330395,
worse accepted = 42.85%
Gen #168: temp = 0.000933, best score = 0.00285724, cur score = 0.00558160,
worse accepted = 50.49%
Gen #169: temp = 0.000924, best score = 0.00285724, cur score = 0.00439443,
worse accepted = 40.60%
Gen #170: temp = 0.000915, best score = 0.00285724, cur score = 0.00557449,
worse accepted = 48.49%
Gen #171: temp = 0.000906, best score = 0.00285724, cur score = 0.00477536,
worse accepted = 47.37%
Gen #172: temp = 0.000897, best score = 0.00285724, cur score = 0.00623580,
worse accepted = 44.56%
Gen #173: temp = 0.000888, best score = 0.00285724, cur score = 0.00632709,
worse accepted = 49.26%
Gen #174: temp = 0.000879, best score = 0.00285724, cur score = 0.00353368,
worse accepted = 48.93%
Gen #175: temp = 0.000870, best score = 0.00285724, cur score = 0.00333064,
worse accepted = 48.02%
Gen #176: temp = 0.000861, best score = 0.00285724, cur score = 0.00472821,
worse accepted = 45.38%
Gen #177: temp = 0.000853, best score = 0.00285724, cur score = 0.00376607,
worse accepted = 49.57%
Gen #178: temp = 0.000844, best score = 0.00285724, cur score = 0.00679404,
worse accepted = 44.16%
Gen #179: temp = 0.000836, best score = 0.00285724, cur score = 0.00424395,
worse accepted = 45.39%
Gen #180: temp = 0.000827, best score = 0.00285724, cur score = 0.00431161,
worse accepted = 52.31%
Gen #181: temp = 0.000819, best score = 0.00285724, cur score = 0.00532178,
worse accepted = 41.52%
Gen #182: temp = 0.000811, best score = 0.00285724, cur score = 0.00725686,
worse accepted = 43.94%
Gen #183: temp = 0.000803, best score = 0.00285724, cur score = 0.00391970,
worse accepted = 39.48%
Gen #184: temp = 0.000795, best score = 0.00285724, cur score = 0.00629926,
worse accepted = 39.86%
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Gen #185: temp = 0.000787, best score = 0.00285724, cur score = 0.00434761,
worse accepted = 48.12%
Gen #186: temp = 0.000779, best score = 0.00285724, cur score = 0.00567675,
worse accepted = 45.99%
Gen #187: temp = 0.000771, best score = 0.00285724, cur score = 0.00520515,
worse accepted = 38.56%
Gen #188: temp = 0.000763, best score = 0.00285724, cur score = 0.00405802,
worse accepted = 45.40%
Gen #189: temp = 0.000756, best score = 0.00285724, cur score = 0.00363323,
worse accepted = 46.72%
Gen #190: temp = 0.000748, best score = 0.00285724, cur score = 0.00720549,
worse accepted = 41.71%
Gen #191: temp = 0.000741, best score = 0.00285724, cur score = 0.00500076,
worse accepted = 43.34%
Gen #192: temp = 0.000733, best score = 0.00285724, cur score = 0.00523665,
worse accepted = 42.50%
Gen #193: temp = 0.000726, best score = 0.00285724, cur score = 0.00323892,
worse accepted = 40.97%
Gen #194: temp = 0.000719, best score = 0.00285724, cur score = 0.00420707,
worse accepted = 46.31%
Gen #195: temp = 0.000712, best score = 0.00285724, cur score = 0.00527003,
worse accepted = 45.95%
Gen #196: temp = 0.000704, best score = 0.00285724, cur score = 0.00653874,
worse accepted = 39.11%
Gen #197: temp = 0.000697, best score = 0.00285724, cur score = 0.00432988,
worse accepted = 39.45%
Gen #198: temp = 0.000690, best score = 0.00285724, cur score = 0.00457452,
worse accepted = 42.71%
Gen #199: temp = 0.000684, best score = 0.00285724, cur score = 0.00496368,
worse accepted = 39.11%
Gen #200: temp = 0.000677, best score = 0.00285724, cur score = 0.00385906,
worse accepted = 41.40%
Gen #201: temp = 0.000670, best score = 0.00285724, cur score = 0.00344464,
worse accepted = 34.68%
Gen #202: temp = 0.000663, best score = 0.00285724, cur score = 0.00304155,
worse accepted = 41.86%
Gen #203: temp = 0.000657, best score = 0.00285724, cur score = 0.00361686,
worse accepted = 42.52%
Gen #204: temp = 0.000650, best score = 0.00285724, cur score = 0.00510294,
worse accepted = 42.83%
Gen #205: temp = 0.000644, best score = 0.00285724, cur score = 0.00418922,
worse accepted = 42.21%
Gen #206: temp = 0.000637, best score = 0.00285724, cur score = 0.00603999,
worse accepted = 43.58%
Gen #207: temp = 0.000631, best score = 0.00285724, cur score = 0.00455758,
worse accepted = 41.82%
Gen #208: temp = 0.000624, best score = 0.00285724, cur score = 0.00638530,
worse accepted = 41.49%
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Gen #209: temp = 0.000618, best score = 0.00285724, cur score = 0.00428917,
worse accepted = 43.09%
Gen #210: temp = 0.000612, best score = 0.00285724, cur score = 0.00351656,
worse accepted = 40.22%
Gen #211: temp = 0.000606, best score = 0.00285724, cur score = 0.00380776,
worse accepted = 42.34%
Gen #212: temp = 0.000600, best score = 0.00285724, cur score = 0.00616556,
worse accepted = 43.38%
Gen #213: temp = 0.000594, best score = 0.00285724, cur score = 0.00507515,
worse accepted = 37.22%
Gen #214: temp = 0.000588, best score = 0.00285724, cur score = 0.00572811,
worse accepted = 38.08%
Gen #215: temp = 0.000582, best score = 0.00285724, cur score = 0.00333333,
worse accepted = 41.02%
Gen #216: temp = 0.000576, best score = 0.00285724, cur score = 0.00476241,
worse accepted = 44.16%
Gen #217: temp = 0.000570, best score = 0.00285724, cur score = 0.00450180,
worse accepted = 41.05%
Gen #218: temp = 0.000565, best score = 0.00285724, cur score = 0.00352798,
worse accepted = 42.95%
Gen #219: temp = 0.000559, best score = 0.00285724, cur score = 0.00602752,
worse accepted = 42.21%
Gen #220: temp = 0.000553, best score = 0.00285724, cur score = 0.00459226,
worse accepted = 39.73%
Gen #221: temp = 0.000548, best score = 0.00285724, cur score = 0.00504306,
worse accepted = 41.82%
Gen #222: temp = 0.000542, best score = 0.00285724, cur score = 0.00445342,
worse accepted = 39.02%
Gen #223: temp = 0.000537, best score = 0.00285724, cur score = 0.00385125,
worse accepted = 41.21%
Gen #224: temp = 0.000532, best score = 0.00285724, cur score = 0.00386918,
worse accepted = 37.87%
Gen #225: temp = 0.000526, best score = 0.00285724, cur score = 0.00532479,
worse accepted = 38.58%
Gen #226: temp = 0.000521, best score = 0.00285724, cur score = 0.00436690,
worse accepted = 41.29%
Gen #227: temp = 0.000516, best score = 0.00285724, cur score = 0.00380310,
worse accepted = 41.65%
Gen #228: temp = 0.000511, best score = 0.00285724, cur score = 0.00514729,
worse accepted = 43.00%
Gen #229: temp = 0.000506, best score = 0.00285724, cur score = 0.00417946,
worse accepted = 38.85%
Gen #230: temp = 0.000501, best score = 0.00285724, cur score = 0.00372760,
worse accepted = 39.16%
Gen #231: temp = 0.000496, best score = 0.00285724, cur score = 0.00418361,
worse accepted = 39.32%
Gen #232: temp = 0.000491, best score = 0.00285724, cur score = 0.00462627,
worse accepted = 37.21%
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Gen #233: temp = 0.000486, best score = 0.00285724, cur score = 0.00566664,
worse accepted = 36.28%
Gen #234: temp = 0.000481, best score = 0.00285724, cur score = 0.00392156,
worse accepted = 38.38%
Gen #235: temp = 0.000476, best score = 0.00285244, cur score = 0.00542457,
worse accepted = 40.90%
Gen #236: temp = 0.000471, best score = 0.00285244, cur score = 0.00413817,
worse accepted = 41.36%
Gen #237: temp = 0.000467, best score = 0.00285244, cur score = 0.00410812,
worse accepted = 37.16%
Gen #238: temp = 0.000462, best score = 0.00285244, cur score = 0.00390770,
worse accepted = 40.53%
Gen #239: temp = 0.000457, best score = 0.00285244, cur score = 0.00378615,
worse accepted = 37.31%
Gen #240: temp = 0.000453, best score = 0.00285244, cur score = 0.00556332,
worse accepted = 34.44%
Gen #241: temp = 0.000448, best score = 0.00285244, cur score = 0.00434417,
worse accepted = 41.37%
Gen #242: temp = 0.000444, best score = 0.00285244, cur score = 0.00410435,
worse accepted = 34.59%
Gen #243: temp = 0.000439, best score = 0.00285244, cur score = 0.00488086,
worse accepted = 41.62%
Gen #244: temp = 0.000435, best score = 0.00285244, cur score = 0.00438535,
worse accepted = 36.12%
Gen #245: temp = 0.000430, best score = 0.00285244, cur score = 0.00621146,
worse accepted = 33.36%
Gen #246: temp = 0.000426, best score = 0.00285244, cur score = 0.00434226,
worse accepted = 38.63%
Gen #247: temp = 0.000422, best score = 0.00285244, cur score = 0.00510567,
worse accepted = 40.77%
Gen #248: temp = 0.000418, best score = 0.00285244, cur score = 0.00309723,
worse accepted = 35.43%
Gen #249: temp = 0.000414, best score = 0.00285244, cur score = 0.00458824,
worse accepted = 36.34%
Gen #250: temp = 0.000409, best score = 0.00285244, cur score = 0.00373483,
worse accepted = 35.30%
Gen #251: temp = 0.000405, best score = 0.00285244, cur score = 0.00389767,
worse accepted = 39.71%
Gen #252: temp = 0.000401, best score = 0.00285244, cur score = 0.00401981,
worse accepted = 39.13%
Gen #253: temp = 0.000397, best score = 0.00285244, cur score = 0.00379353,
worse accepted = 36.03%
Gen #254: temp = 0.000393, best score = 0.00285244, cur score = 0.00313648,
worse accepted = 37.34%
Gen #255: temp = 0.000389, best score = 0.00285160, cur score = 0.00415340,
worse accepted = 39.34%
Gen #256: temp = 0.000385, best score = 0.00284892, cur score = 0.00341247,
worse accepted = 37.33%

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Gen #257: temp = 0.000382, best score = 0.00284892, cur score = 0.00455991,
worse accepted = 33.72%
Gen #258: temp = 0.000378, best score = 0.00284892, cur score = 0.00350934,
worse accepted = 34.08%
Gen #259: temp = 0.000374, best score = 0.00284892, cur score = 0.00354526,
worse accepted = 37.70%
Gen #260: temp = 0.000370, best score = 0.00284892, cur score = 0.00391668,
worse accepted = 36.79%
Gen #261: temp = 0.000367, best score = 0.00284892, cur score = 0.00381029,
worse accepted = 35.43%
Gen #262: temp = 0.000363, best score = 0.00284892, cur score = 0.00573627,
worse accepted = 34.96%
Gen #263: temp = 0.000359, best score = 0.00284892, cur score = 0.00356559,
worse accepted = 31.86%
Gen #264: temp = 0.000356, best score = 0.00284892, cur score = 0.00431156,
worse accepted = 33.40%
Gen #265: temp = 0.000352, best score = 0.00284892, cur score = 0.00402439,
worse accepted = 38.52%
Gen #266: temp = 0.000349, best score = 0.00284892, cur score = 0.00429151,
worse accepted = 33.37%
Gen #267: temp = 0.000345, best score = 0.00284892, cur score = 0.00368434,
worse accepted = 31.85%
Gen #268: temp = 0.000342, best score = 0.00284892, cur score = 0.00409174,
worse accepted = 33.70%
Gen #269: temp = 0.000338, best score = 0.00284892, cur score = 0.00361346,
worse accepted = 33.51%
Gen #270: temp = 0.000335, best score = 0.00284716, cur score = 0.00388312,
worse accepted = 36.05%
Gen #271: temp = 0.000331, best score = 0.00284716, cur score = 0.00344516,
worse accepted = 36.42%
Gen #272: temp = 0.000328, best score = 0.00284716, cur score = 0.00346151,
worse accepted = 34.72%
Gen #273: temp = 0.000325, best score = 0.00284716, cur score = 0.00375287,
worse accepted = 35.43%
Gen #274: temp = 0.000322, best score = 0.00283133, cur score = 0.00380029,
worse accepted = 36.47%
Gen #275: temp = 0.000318, best score = 0.00283133, cur score = 0.00401724,
worse accepted = 34.73%
Gen #276: temp = 0.000315, best score = 0.00283133, cur score = 0.00421533,
worse accepted = 38.40%
Gen #277: temp = 0.000312, best score = 0.00283133, cur score = 0.00453773,
worse accepted = 33.53%
Gen #278: temp = 0.000309, best score = 0.00283133, cur score = 0.00344475,
worse accepted = 38.45%
Gen #279: temp = 0.000306, best score = 0.00283133, cur score = 0.00448776,
worse accepted = 36.60%
Gen #280: temp = 0.000303, best score = 0.00283133, cur score = 0.00290620,
worse accepted = 32.80%
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Gen #281: temp = 0.000300, best score = 0.00283133, cur score = 0.00466822,
worse accepted = 32.58%
Gen #282: temp = 0.000297, best score = 0.00283133, cur score = 0.00366592,
worse accepted = 34.01%
Gen #283: temp = 0.000294, best score = 0.00283133, cur score = 0.00330197,
worse accepted = 33.50%
Gen #284: temp = 0.000291, best score = 0.00283133, cur score = 0.00348565,
worse accepted = 34.74%
Gen #285: temp = 0.000288, best score = 0.00282863, cur score = 0.00420625,
worse accepted = 37.74%
Gen #286: temp = 0.000285, best score = 0.00282863, cur score = 0.00404389,
worse accepted = 35.42%
Gen #287: temp = 0.000282, best score = 0.00282863, cur score = 0.00340774,
worse accepted = 37.36%
Gen #288: temp = 0.000279, best score = 0.00282863, cur score = 0.00330753,
worse accepted = 32.33%
Gen #289: temp = 0.000277, best score = 0.00282863, cur score = 0.00365465,
worse accepted = 36.88%
Gen #290: temp = 0.000274, best score = 0.00282863, cur score = 0.00437310,
worse accepted = 32.74%
Gen #291: temp = 0.000271, best score = 0.00282863, cur score = 0.00472621,
worse accepted = 37.22%
Gen #292: temp = 0.000268, best score = 0.00282863, cur score = 0.00326788,
worse accepted = 32.55%
Gen #293: temp = 0.000266, best score = 0.00282863, cur score = 0.00371258,
worse accepted = 34.26%
Gen #294: temp = 0.000263, best score = 0.00282863, cur score = 0.00375451,
worse accepted = 36.83%
Gen #295: temp = 0.000260, best score = 0.00282863, cur score = 0.00354619,
worse accepted = 34.71%
Gen #296: temp = 0.000258, best score = 0.00282863, cur score = 0.00411793,
worse accepted = 33.62%
Gen #297: temp = 0.000255, best score = 0.00282863, cur score = 0.00351808,
worse accepted = 35.97%
Gen #298: temp = 0.000253, best score = 0.00282863, cur score = 0.00473635,
worse accepted = 32.83%
Gen #299: temp = 0.000250, best score = 0.00282863, cur score = 0.00332133,
worse accepted = 35.94%
Gen #300: temp = 0.000248, best score = 0.00282863, cur score = 0.00403170,
worse accepted = 37.58%
Gen #301: temp = 0.000245, best score = 0.00282863, cur score = 0.00363089,
worse accepted = 33.79%
Gen #302: temp = 0.000243, best score = 0.00282863, cur score = 0.00334090,
worse accepted = 33.62%
Gen #303: temp = 0.000240, best score = 0.00282863, cur score = 0.00346034,
worse accepted = 32.57%
Gen #304: temp = 0.000238, best score = 0.00282863, cur score = 0.00377138,
worse accepted = 35.91%
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Gen #305: temp = 0.000236, best score = 0.00282863, cur score = 0.00364900,
worse accepted = 33.36%
Gen #306: temp = 0.000233, best score = 0.00282863, cur score = 0.00367931,
worse accepted = 32.38%
Gen #307: temp = 0.000231, best score = 0.00282863, cur score = 0.00361415,
worse accepted = 32.17%
Gen #308: temp = 0.000229, best score = 0.00282707, cur score = 0.00335282,
worse accepted = 34.15%
Gen #309: temp = 0.000226, best score = 0.00282707, cur score = 0.00421006,
worse accepted = 33.55%
Gen #310: temp = 0.000224, best score = 0.00282707, cur score = 0.00333930,
worse accepted = 30.82%
Gen #311: temp = 0.000222, best score = 0.00282707, cur score = 0.00305884,
worse accepted = 30.77%
Gen #312: temp = 0.000220, best score = 0.00282707, cur score = 0.00362382,
worse accepted = 32.65%
Gen #313: temp = 0.000217, best score = 0.00282707, cur score = 0.00404551,
worse accepted = 32.88%
Gen #314: temp = 0.000215, best score = 0.00282707, cur score = 0.00392790,
worse accepted = 34.21%
Gen #315: temp = 0.000213, best score = 0.00282707, cur score = 0.00313877,
worse accepted = 34.87%
Gen #316: temp = 0.000211, best score = 0.00282707, cur score = 0.00332842,
worse accepted = 33.85%
Gen #317: temp = 0.000209, best score = 0.00282707, cur score = 0.00367879,
worse accepted = 32.30%
Gen #318: temp = 0.000207, best score = 0.00282707, cur score = 0.00362660,
worse accepted = 34.13%
Gen #319: temp = 0.000205, best score = 0.00282707, cur score = 0.00359267,
worse accepted = 31.21%
Gen #320: temp = 0.000203, best score = 0.00282707, cur score = 0.00377073,
worse accepted = 30.53%
Gen #321: temp = 0.000201, best score = 0.00282707, cur score = 0.00377869,
worse accepted = 33.08%
Gen #322: temp = 0.000199, best score = 0.00282707, cur score = 0.00341892,
worse accepted = 29.81%
Gen #323: temp = 0.000197, best score = 0.00282707, cur score = 0.00307377,
worse accepted = 32.31%
Gen #324: temp = 0.000195, best score = 0.00282707, cur score = 0.00331228,
worse accepted = 30.14%
Gen #325: temp = 0.000193, best score = 0.00282707, cur score = 0.00334501,
worse accepted = 32.47%
Gen #326: temp = 0.000191, best score = 0.00282707, cur score = 0.00323174,
worse accepted = 30.87%
Gen #327: temp = 0.000189, best score = 0.00282707, cur score = 0.00316980,
worse accepted = 32.61%
Gen #328: temp = 0.000187, best score = 0.00282707, cur score = 0.00366426,
worse accepted = 31.73%
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Gen #329: temp = 0.000185, best score = 0.00282707, cur score = 0.00340464,
worse accepted = 33.09%
Gen #330: temp = 0.000183, best score = 0.00282707, cur score = 0.00375947,
worse accepted = 29.05%
Gen #331: temp = 0.000181, best score = 0.00282707, cur score = 0.00385325,
worse accepted = 29.98%
Gen #332: temp = 0.000180, best score = 0.00282707, cur score = 0.00373885,
worse accepted = 31.91%
Gen #333: temp = 0.000178, best score = 0.00282707, cur score = 0.00392037,
worse accepted = 31.33%
Gen #334: temp = 0.000176, best score = 0.00282707, cur score = 0.00373480,
worse accepted = 30.22%
Gen #335: temp = 0.000174, best score = 0.00282707, cur score = 0.00330832,
worse accepted = 31.13%
Gen #336: temp = 0.000172, best score = 0.00282707, cur score = 0.00333742,
worse accepted = 33.23%
Gen #337: temp = 0.000171, best score = 0.00282707, cur score = 0.00324919,
worse accepted = 32.19%
Gen #338: temp = 0.000169, best score = 0.00282707, cur score = 0.00301687,
worse accepted = 30.75%
Gen #339: temp = 0.000167, best score = 0.00282707, cur score = 0.00306345,
worse accepted = 32.04%
Gen #340: temp = 0.000166, best score = 0.00282707, cur score = 0.00306615,
worse accepted = 29.96%
Gen #341: temp = 0.000164, best score = 0.00282707, cur score = 0.00375873,
worse accepted = 33.25%
Gen #342: temp = 0.000162, best score = 0.00282707, cur score = 0.00341059,
worse accepted = 32.09%
Gen #343: temp = 0.000161, best score = 0.00282707, cur score = 0.00302194,
worse accepted = 31.58%
Gen #344: temp = 0.000159, best score = 0.00282707, cur score = 0.00325162,
worse accepted = 32.21%
Gen #345: temp = 0.000158, best score = 0.00282707, cur score = 0.00329316,
worse accepted = 30.21%
Gen #346: temp = 0.000156, best score = 0.00282707, cur score = 0.00366076,
worse accepted = 33.81%
Gen #347: temp = 0.000154, best score = 0.00282707, cur score = 0.00324722,
worse accepted = 31.59%
Gen #348: temp = 0.000153, best score = 0.00282707, cur score = 0.00324932,
worse accepted = 31.75%
Gen #349: temp = 0.000151, best score = 0.00282707, cur score = 0.00346291,
worse accepted = 32.63%
Gen #350: temp = 0.000150, best score = 0.00282707, cur score = 0.00327633,
worse accepted = 32.70%
Gen #351: temp = 0.000148, best score = 0.00282707, cur score = 0.00315807,
worse accepted = 28.37%
Gen #352: temp = 0.000147, best score = 0.00282707, cur score = 0.00345903,
worse accepted = 30.29%
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Gen #353: temp = 0.000145, best score = 0.00282707, cur score = 0.00368220,
worse accepted = 29.98%
Gen #354: temp = 0.000144, best score = 0.00282707, cur score = 0.00342331,
worse accepted = 31.96%
Gen #355: temp = 0.000143, best score = 0.00282707, cur score = 0.00349209,
worse accepted = 31.19%
Gen #356: temp = 0.000141, best score = 0.00282707, cur score = 0.00342246,
worse accepted = 30.67%
Gen #357: temp = 0.000140, best score = 0.00282707, cur score = 0.00388715,
worse accepted = 29.79%
Gen #358: temp = 0.000138, best score = 0.00282707, cur score = 0.00349662,
worse accepted = 30.10%
Gen #359: temp = 0.000137, best score = 0.00282707, cur score = 0.00354770,
worse accepted = 29.60%
Gen #360: temp = 0.000136, best score = 0.00282707, cur score = 0.00322615,
worse accepted = 29.32%
Gen #361: temp = 0.000134, best score = 0.00282707, cur score = 0.00331733,
worse accepted = 29.58%
Gen #362: temp = 0.000133, best score = 0.00282707, cur score = 0.00334791,
worse accepted = 28.55%
Gen #363: temp = 0.000131, best score = 0.00282707, cur score = 0.00327943,
worse accepted = 28.86%
Gen #364: temp = 0.000130, best score = 0.00282707, cur score = 0.00344832,
worse accepted = 29.43%
Gen #365: temp = 0.000129, best score = 0.00282707, cur score = 0.00314430,
worse accepted = 30.02%
Gen #366: temp = 0.000128, best score = 0.00282707, cur score = 0.00348943,
worse accepted = 27.00%
Gen #367: temp = 0.000126, best score = 0.00282707, cur score = 0.00353448,
worse accepted = 29.15%
Gen #368: temp = 0.000125, best score = 0.00282707, cur score = 0.00341321,
worse accepted = 30.55%
Gen #369: temp = 0.000124, best score = 0.00282707, cur score = 0.00316750,
worse accepted = 27.35%
Gen #370: temp = 0.000123, best score = 0.00282707, cur score = 0.00346143,
worse accepted = 28.79%
Gen #371: temp = 0.000121, best score = 0.00282707, cur score = 0.00297485,
worse accepted = 28.17%
Gen #372: temp = 0.000120, best score = 0.00282707, cur score = 0.00291242,
worse accepted = 29.44%
Gen #373: temp = 0.000119, best score = 0.00282707, cur score = 0.00293781,
worse accepted = 28.02%
Gen #374: temp = 0.000118, best score = 0.00282707, cur score = 0.00303008,
worse accepted = 26.89%
Gen #375: temp = 0.000117, best score = 0.00282707, cur score = 0.00317566,
worse accepted = 29.18%
Gen #376: temp = 0.000115, best score = 0.00282707, cur score = 0.00323766,
worse accepted = 27.85%
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Gen #377: temp = 0.000114, best score = 0.00282707, cur score = 0.00362832,
worse accepted = 27.93%
Gen #378: temp = 0.000113, best score = 0.00282707, cur score = 0.00334752,
worse accepted = 27.62%
Gen #379: temp = 0.000112, best score = 0.00282707, cur score = 0.00337238,
worse accepted = 25.75%
Gen #380: temp = 0.000111, best score = 0.00282707, cur score = 0.00306318,
worse accepted = 28.56%
Gen #381: temp = 0.000110, best score = 0.00282707, cur score = 0.00330760,
worse accepted = 26.65%
Gen #382: temp = 0.000109, best score = 0.00282707, cur score = 0.00341360,
worse accepted = 27.43%
Gen #383: temp = 0.000108, best score = 0.00282707, cur score = 0.00323291,
worse accepted = 27.48%
Gen #384: temp = 0.000106, best score = 0.00282707, cur score = 0.00305007,
worse accepted = 27.08%
Gen #385: temp = 0.000105, best score = 0.00282707, cur score = 0.00356594,
worse accepted = 26.04%
Gen #386: temp = 0.000104, best score = 0.00282707, cur score = 0.00328454,
worse accepted = 26.28%
Gen #387: temp = 0.000103, best score = 0.00282707, cur score = 0.00312424,
worse accepted = 26.84%
Gen #388: temp = 0.000102, best score = 0.00282707, cur score = 0.00303456,
worse accepted = 27.53%
Gen #389: temp = 0.000101, best score = 0.00282707, cur score = 0.00325729,
worse accepted = 25.75%
Gen #390: temp = 0.000100, best score = 0.00282707, cur score = 0.00306856,
worse accepted = 26.28%
Gen #391: temp = 0.000099, best score = 0.00282707, cur score = 0.00312904,
worse accepted = 26.46%
Gen #392: temp = 0.000098, best score = 0.00282707, cur score = 0.00311181,
worse accepted = 25.93%
Gen #393: temp = 0.000097, best score = 0.00282707, cur score = 0.00309566,
worse accepted = 25.27%
Gen #394: temp = 0.000096, best score = 0.00282707, cur score = 0.00297165,
worse accepted = 26.20%
Gen #395: temp = 0.000095, best score = 0.00282707, cur score = 0.00334778,
worse accepted = 25.14%
Gen #396: temp = 0.000094, best score = 0.00282707, cur score = 0.00295582,
worse accepted = 25.41%
Gen #397: temp = 0.000093, best score = 0.00282341, cur score = 0.00329927,
worse accepted = 25.92%
Gen #398: temp = 0.000093, best score = 0.00282341, cur score = 0.00348917,
worse accepted = 24.77%
Gen #399: temp = 0.000092, best score = 0.00282341, cur score = 0.00288801,
worse accepted = 25.37%
Gen #400: temp = 0.000091, best score = 0.00282341, cur score = 0.00301037,
worse accepted = 24.44%
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Gen #401: temp = 0.000090, best score = 0.00282341, cur score = 0.00301825,
worse accepted = 24.93%
Gen #402: temp = 0.000089, best score = 0.00282341, cur score = 0.00322519,
worse accepted = 24.61%
Gen #403: temp = 0.000088, best score = 0.00282341, cur score = 0.00316572,
worse accepted = 24.73%
Gen #404: temp = 0.000087, best score = 0.00282341, cur score = 0.00305876,
worse accepted = 23.89%
Gen #405: temp = 0.000086, best score = 0.00282341, cur score = 0.00320847,
worse accepted = 24.40%
Gen #406: temp = 0.000085, best score = 0.00282341, cur score = 0.00307490,
worse accepted = 23.12%
Gen #407: temp = 0.000085, best score = 0.00282341, cur score = 0.00333094,
worse accepted = 24.59%
Gen #408: temp = 0.000084, best score = 0.00282341, cur score = 0.00304226,
worse accepted = 23.30%
Gen #409: temp = 0.000083, best score = 0.00282341, cur score = 0.00297328,
worse accepted = 24.15%
Gen #410: temp = 0.000082, best score = 0.00282341, cur score = 0.00295387,
worse accepted = 24.08%
Gen #411: temp = 0.000081, best score = 0.00282259, cur score = 0.00319005,
worse accepted = 24.27%
Gen #412: temp = 0.000080, best score = 0.00282259, cur score = 0.00307978,
worse accepted = 22.38%
Gen #413: temp = 0.000080, best score = 0.00282259, cur score = 0.00333405,
worse accepted = 23.19%
Gen #414: temp = 0.000079, best score = 0.00282259, cur score = 0.00308953,
worse accepted = 22.90%
Gen #415: temp = 0.000078, best score = 0.00282259, cur score = 0.00302112,
worse accepted = 23.07%
Gen #416: temp = 0.000077, best score = 0.00282259, cur score = 0.00300253,
worse accepted = 23.94%
Gen #417: temp = 0.000076, best score = 0.00282259, cur score = 0.00306395,
worse accepted = 23.10%
Gen #418: temp = 0.000076, best score = 0.00282259, cur score = 0.00301246,
worse accepted = 23.50%
Gen #419: temp = 0.000075, best score = 0.00282259, cur score = 0.00296086,
worse accepted = 21.86%
Gen #420: temp = 0.000074, best score = 0.00282259, cur score = 0.00318728,
worse accepted = 22.24%
Gen #421: temp = 0.000073, best score = 0.00282259, cur score = 0.00309908,
worse accepted = 22.05%
Gen #422: temp = 0.000073, best score = 0.00282259, cur score = 0.00311740,
worse accepted = 21.43%
Gen #423: temp = 0.000072, best score = 0.00282259, cur score = 0.00314484,
worse accepted = 21.50%
Gen #424: temp = 0.000071, best score = 0.00282259, cur score = 0.00320978,
worse accepted = 21.36%
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Gen #425: temp = 0.000071, best score = 0.00282259, cur score = 0.00314168,
worse accepted = 21.10%
Gen #426: temp = 0.000070, best score = 0.00282259, cur score = 0.00313961,
worse accepted = 21.45%
Gen #427: temp = 0.000069, best score = 0.00282259, cur score = 0.00309165,
worse accepted = 21.53%
Gen #428: temp = 0.000068, best score = 0.00282259, cur score = 0.00290536,
worse accepted = 21.28%
Gen #429: temp = 0.000068, best score = 0.00282259, cur score = 0.00290170,
worse accepted = 20.57%
Gen #430: temp = 0.000067, best score = 0.00282259, cur score = 0.00308106,
worse accepted = 19.95%
Gen #431: temp = 0.000066, best score = 0.00282259, cur score = 0.00301861,
worse accepted = 20.23%
Gen #432: temp = 0.000066, best score = 0.00282259, cur score = 0.00311829,
worse accepted = 19.52%
Gen #433: temp = 0.000065, best score = 0.00282259, cur score = 0.00291756,
worse accepted = 19.55%
Gen #434: temp = 0.000064, best score = 0.00282259, cur score = 0.00302955,
worse accepted = 20.17%
Gen #435: temp = 0.000064, best score = 0.00282259, cur score = 0.00299486,
worse accepted = 19.37%
Gen #436: temp = 0.000063, best score = 0.00282259, cur score = 0.00296153,
worse accepted = 19.96%
Gen #437: temp = 0.000063, best score = 0.00282259, cur score = 0.00317856,
worse accepted = 19.29%
Gen #438: temp = 0.000062, best score = 0.00282259, cur score = 0.00292935,
worse accepted = 19.06%
Gen #439: temp = 0.000061, best score = 0.00282259, cur score = 0.00296375,
worse accepted = 19.31%
Gen #440: temp = 0.000061, best score = 0.00282259, cur score = 0.00332955,
worse accepted = 19.46%
Gen #441: temp = 0.000060, best score = 0.00282259, cur score = 0.00293250,
worse accepted = 18.72%
Gen #442: temp = 0.000059, best score = 0.00282259, cur score = 0.00320816,
worse accepted = 18.75%
Gen #443: temp = 0.000059, best score = 0.00282259, cur score = 0.00312360,
worse accepted = 18.62%
Gen #444: temp = 0.000058, best score = 0.00282259, cur score = 0.00323628,
worse accepted = 16.47%
Gen #445: temp = 0.000058, best score = 0.00282259, cur score = 0.00294189,
worse accepted = 18.04%
Gen #446: temp = 0.000057, best score = 0.00282259, cur score = 0.00299057,
worse accepted = 17.51%
Gen #447: temp = 0.000057, best score = 0.00282259, cur score = 0.00311866,
worse accepted = 17.43%
Gen #448: temp = 0.000056, best score = 0.00282259, cur score = 0.00289569,
worse accepted = 18.37%
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Gen #449: temp = 0.000055, best score = 0.00282259, cur score = 0.00308571,
worse accepted = 17.45%
Gen #450: temp = 0.000055, best score = 0.00282259, cur score = 0.00295223,
worse accepted = 17.19%
Gen #451: temp = 0.000054, best score = 0.00282259, cur score = 0.00304130,
worse accepted = 17.34%
Gen #452: temp = 0.000054, best score = 0.00282259, cur score = 0.00319281,
worse accepted = 17.47%
Gen #453: temp = 0.000053, best score = 0.00282259, cur score = 0.00294173,
worse accepted = 16.68%
Gen #454: temp = 0.000053, best score = 0.00282259, cur score = 0.00301078,
worse accepted = 16.82%
Gen #455: temp = 0.000052, best score = 0.00282259, cur score = 0.00296618,
worse accepted = 17.18%
Gen #456: temp = 0.000052, best score = 0.00282259, cur score = 0.00302446,
worse accepted = 15.78%
Gen #457: temp = 0.000051, best score = 0.00282259, cur score = 0.00293257,
worse accepted = 16.20%
Gen #458: temp = 0.000051, best score = 0.00282259, cur score = 0.00296435,
worse accepted = 15.91%
Gen #459: temp = 0.000050, best score = 0.00282259, cur score = 0.00292432,
worse accepted = 15.98%
Gen #460: temp = 0.000050, best score = 0.00282259, cur score = 0.00312513,
worse accepted = 15.47%
Gen #461: temp = 0.000049, best score = 0.00282259, cur score = 0.00309671,
worse accepted = 15.66%
Gen #462: temp = 0.000049, best score = 0.00282259, cur score = 0.00320162,
worse accepted = 15.39%
Gen #463: temp = 0.000048, best score = 0.00282259, cur score = 0.00296801,
worse accepted = 15.51%
Gen #464: temp = 0.000048, best score = 0.00282259, cur score = 0.00295784,
worse accepted = 14.43%
Gen #465: temp = 0.000047, best score = 0.00282259, cur score = 0.00292860,
worse accepted = 14.24%
Gen #466: temp = 0.000047, best score = 0.00282259, cur score = 0.00290396,
worse accepted = 14.48%
Gen #467: temp = 0.000046, best score = 0.00282259, cur score = 0.00302318,
worse accepted = 14.39%
Gen #468: temp = 0.000046, best score = 0.00282259, cur score = 0.00314423,
worse accepted = 14.64%
Gen #469: temp = 0.000045, best score = 0.00282259, cur score = 0.00304459,
worse accepted = 14.02%
Gen #470: temp = 0.000045, best score = 0.00282259, cur score = 0.00317293,
worse accepted = 13.49%
Gen #471: temp = 0.000044, best score = 0.00282259, cur score = 0.00298286,
worse accepted = 14.36%
Gen #472: temp = 0.000044, best score = 0.00282259, cur score = 0.00289757,
worse accepted = 13.23%
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Gen #473: temp = 0.000044, best score = 0.00282259, cur score = 0.00302014,
worse accepted = 12.92%
Gen #474: temp = 0.000043, best score = 0.00282259, cur score = 0.00299276,
worse accepted = 13.37%
Gen #475: temp = 0.000043, best score = 0.00282259, cur score = 0.00297518,
worse accepted = 13.39%
Gen #476: temp = 0.000042, best score = 0.00282259, cur score = 0.00284788,
worse accepted = 13.48%
Gen #477: temp = 0.000042, best score = 0.00282259, cur score = 0.00291658,
worse accepted = 12.33%
Gen #478: temp = 0.000041, best score = 0.00282259, cur score = 0.00289335,
worse accepted = 12.66%
Gen #479: temp = 0.000041, best score = 0.00282259, cur score = 0.00293162,
worse accepted = 12.68%
Gen #480: temp = 0.000041, best score = 0.00282259, cur score = 0.00287613,
worse accepted = 12.99%
Gen #481: temp = 0.000040, best score = 0.00282259, cur score = 0.00301572,
worse accepted = 12.19%
Gen #482: temp = 0.000040, best score = 0.00282259, cur score = 0.00295401,
worse accepted = 12.12%
Gen #483: temp = 0.000039, best score = 0.00282259, cur score = 0.00308036,
worse accepted = 11.98%
Gen #484: temp = 0.000039, best score = 0.00282259, cur score = 0.00297283,
worse accepted = 11.83%
Gen #485: temp = 0.000039, best score = 0.00282259, cur score = 0.00311687,
worse accepted = 11.94%
Gen #486: temp = 0.000038, best score = 0.00282259, cur score = 0.00293119,
worse accepted = 11.74%
Gen #487: temp = 0.000038, best score = 0.00282259, cur score = 0.00291792,
worse accepted = 11.66%
Gen #488: temp = 0.000037, best score = 0.00282259, cur score = 0.00297708,
worse accepted = 11.81%
Gen #489: temp = 0.000037, best score = 0.00282259, cur score = 0.00289087,
worse accepted = 11.27%
Gen #490: temp = 0.000037, best score = 0.00282259, cur score = 0.00292181,
worse accepted = 11.06%
Gen #491: temp = 0.000036, best score = 0.00282259, cur score = 0.00287987,
worse accepted = 10.68%
Gen #492: temp = 0.000036, best score = 0.00282259, cur score = 0.00287143,
worse accepted = 10.85%
Gen #493: temp = 0.000036, best score = 0.00282259, cur score = 0.00285289,
worse accepted = 10.22%
Gen #494: temp = 0.000035, best score = 0.00282259, cur score = 0.00294355,
worse accepted = 10.41%
Gen #495: temp = 0.000035, best score = 0.00282259, cur score = 0.00287476,
worse accepted = 10.15%
Gen #496: temp = 0.000035, best score = 0.00282259, cur score = 0.00296178,
worse accepted = 9.79%
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Gen #497: temp = 0.000034, best score = 0.00282259, cur score = 0.00287321,
worse accepted = 10.35%
Gen #498: temp = 0.000034, best score = 0.00282259, cur score = 0.00294822,
worse accepted = 10.21%
Gen #499: temp = 0.000034, best score = 0.00282259, cur score = 0.00285126,
worse accepted = 9.84%
Gen #500: temp = 0.000033, best score = 0.00282259, cur score = 0.00299118,
worse accepted = 9.52%
Gen #501: temp = 0.000033, best score = 0.00282259, cur score = 0.00296421,
worse accepted = 9.70%
Gen #502: temp = 0.000033, best score = 0.00282259, cur score = 0.00290070,
worse accepted = 8.98%
Gen #503: temp = 0.000032, best score = 0.00282259, cur score = 0.00288846,
worse accepted = 9.36%
Gen #504: temp = 0.000032, best score = 0.00282259, cur score = 0.00287883,
worse accepted = 9.09%
Gen #505: temp = 0.000032, best score = 0.00282259, cur score = 0.00285626,
worse accepted = 9.05%
Gen #506: temp = 0.000031, best score = 0.00282259, cur score = 0.00298409,
worse accepted = 9.15%
Gen #507: temp = 0.000031, best score = 0.00282259, cur score = 0.00287602,
worse accepted = 8.71%
Gen #508: temp = 0.000031, best score = 0.00282223, cur score = 0.00289701,
worse accepted = 8.68%
Gen #509: temp = 0.000030, best score = 0.00282223, cur score = 0.00285410,
worse accepted = 8.78%
Gen #510: temp = 0.000030, best score = 0.00282223, cur score = 0.00288003,
worse accepted = 7.99%
Gen #511: temp = 0.000030, best score = 0.00282223, cur score = 0.00297144,
worse accepted = 8.35%
Gen #512: temp = 0.000029, best score = 0.00282223, cur score = 0.00292541,
worse accepted = 7.70%
Gen #513: temp = 0.000029, best score = 0.00282223, cur score = 0.00289248,
worse accepted = 8.16%
Gen #514: temp = 0.000029, best score = 0.00282223, cur score = 0.00288904,
worse accepted = 8.71%
Gen #515: temp = 0.000029, best score = 0.00282223, cur score = 0.00290133,
worse accepted = 7.82%
Gen #516: temp = 0.000028, best score = 0.00282223, cur score = 0.00296946,
worse accepted = 7.90%
Gen #517: temp = 0.000028, best score = 0.00282223, cur score = 0.00294023,
worse accepted = 7.63%
Gen #518: temp = 0.000028, best score = 0.00282223, cur score = 0.00284506,
worse accepted = 7.26%
Gen #519: temp = 0.000027, best score = 0.00282223, cur score = 0.00290020,
worse accepted = 7.94%
Gen #520: temp = 0.000027, best score = 0.00282223, cur score = 0.00292360,
worse accepted = 7.08%
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Gen #521: temp = 0.000027, best score = 0.00282223, cur score = 0.00293757,
worse accepted = 7.46%
Gen #522: temp = 0.000027, best score = 0.00282223, cur score = 0.00291635,
worse accepted = 7.05%
Gen #523: temp = 0.000026, best score = 0.00282223, cur score = 0.00285100,
worse accepted = 6.05%
Gen #524: temp = 0.000026, best score = 0.00282223, cur score = 0.00297833,
worse accepted = 6.64%
Gen #525: temp = 0.000026, best score = 0.00282223, cur score = 0.00297498,
worse accepted = 6.90%
Gen #526: temp = 0.000026, best score = 0.00282223, cur score = 0.00298213,
worse accepted = 6.58%
Gen #527: temp = 0.000025, best score = 0.00282223, cur score = 0.00284484,
worse accepted = 6.97%
Gen #528: temp = 0.000025, best score = 0.00282223, cur score = 0.00300867,
worse accepted = 6.91%
Gen #529: temp = 0.000025, best score = 0.00282223, cur score = 0.00288896,
worse accepted = 6.55%
Gen #530: temp = 0.000025, best score = 0.00282223, cur score = 0.00284486,
worse accepted = 6.57%
Gen #531: temp = 0.000024, best score = 0.00282223, cur score = 0.00284875,
worse accepted = 6.57%
Gen #532: temp = 0.000024, best score = 0.00282223, cur score = 0.00292814,
worse accepted = 6.81%
Gen #533: temp = 0.000024, best score = 0.00282223, cur score = 0.00286391,
worse accepted = 6.14%
Gen #534: temp = 0.000024, best score = 0.00282223, cur score = 0.00285525,
worse accepted = 5.93%
Gen #535: temp = 0.000023, best score = 0.00282223, cur score = 0.00286751,
worse accepted = 5.67%
Gen #536: temp = 0.000023, best score = 0.00282223, cur score = 0.00287814,
worse accepted = 5.90%
Gen #537: temp = 0.000023, best score = 0.00282223, cur score = 0.00288657,
worse accepted = 5.73%
Gen #538: temp = 0.000023, best score = 0.00282223, cur score = 0.00299457,
worse accepted = 5.69%
Gen #539: temp = 0.000022, best score = 0.00282223, cur score = 0.00295083,
worse accepted = 5.66%
Gen #540: temp = 0.000022, best score = 0.00282223, cur score = 0.00285931,
worse accepted = 4.95%
Gen #541: temp = 0.000022, best score = 0.00282223, cur score = 0.00290690,
worse accepted = 5.05%
Gen #542: temp = 0.000022, best score = 0.00282223, cur score = 0.00293490,
worse accepted = 5.29%
Gen #543: temp = 0.000022, best score = 0.00282223, cur score = 0.00286287,
worse accepted = 5.25%
Gen #544: temp = 0.000021, best score = 0.00282223, cur score = 0.00288313,
worse accepted = 5.23%
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Gen #545: temp = 0.000021, best score = 0.00282223, cur score = 0.00290738,
worse accepted = 4.72%
Gen #546: temp = 0.000021, best score = 0.00282223, cur score = 0.00283607,
worse accepted = 4.52%
Gen #547: temp = 0.000021, best score = 0.00282223, cur score = 0.00284480,
worse accepted = 4.41%
Gen #548: temp = 0.000020, best score = 0.00282223, cur score = 0.00288004,
worse accepted = 4.32%
Gen #549: temp = 0.000020, best score = 0.00282223, cur score = 0.00289577,
worse accepted = 4.95%
Gen #550: temp = 0.000020, best score = 0.00282223, cur score = 0.00283205,
worse accepted = 4.12%
Gen #551: temp = 0.000020, best score = 0.00282223, cur score = 0.00283240,
worse accepted = 4.26%
Gen #552: temp = 0.000020, best score = 0.00282223, cur score = 0.00292852,
worse accepted = 4.40%
Gen #553: temp = 0.000019, best score = 0.00282223, cur score = 0.00290499,
worse accepted = 4.21%
Gen #554: temp = 0.000019, best score = 0.00282223, cur score = 0.00298580,
worse accepted = 4.13%
Gen #555: temp = 0.000019, best score = 0.00282223, cur score = 0.00287161,
worse accepted = 4.67%
Gen #556: temp = 0.000019, best score = 0.00282223, cur score = 0.00290796,
worse accepted = 4.10%
Gen #557: temp = 0.000019, best score = 0.00282223, cur score = 0.00291903,
worse accepted = 3.77%
Gen #558: temp = 0.000019, best score = 0.00282223, cur score = 0.00285752,
worse accepted = 3.90%
Gen #559: temp = 0.000018, best score = 0.00282223, cur score = 0.00291057,
worse accepted = 4.06%
Gen #560: temp = 0.000018, best score = 0.00282223, cur score = 0.00295223,
worse accepted = 3.80%
Gen #561: temp = 0.000018, best score = 0.00282223, cur score = 0.00292932,
worse accepted = 4.02%
Gen #562: temp = 0.000018, best score = 0.00282223, cur score = 0.00285923,
worse accepted = 3.66%
Gen #563: temp = 0.000018, best score = 0.00282223, cur score = 0.00288048,
worse accepted = 2.95%
Gen #564: temp = 0.000017, best score = 0.00282223, cur score = 0.00287099,
worse accepted = 3.15%
Gen #565: temp = 0.000017, best score = 0.00282223, cur score = 0.00287856,
worse accepted = 3.26%
Gen #566: temp = 0.000017, best score = 0.00282223, cur score = 0.00294200,
worse accepted = 3.53%
Gen #567: temp = 0.000017, best score = 0.00282223, cur score = 0.00288120,
worse accepted = 3.29%
Gen #568: temp = 0.000017, best score = 0.00282223, cur score = 0.00296900,
worse accepted = 3.50%
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Gen #569: temp = 0.000017, best score = 0.00282223, cur score = 0.00293022,
worse accepted = 3.12%
Gen #570: temp = 0.000016, best score = 0.00282223, cur score = 0.00287970,
worse accepted = 3.07%
Gen #571: temp = 0.000016, best score = 0.00282223, cur score = 0.00284152,
worse accepted = 3.43%
Gen #572: temp = 0.000016, best score = 0.00282223, cur score = 0.00284834,
worse accepted = 3.08%
Gen #573: temp = 0.000016, best score = 0.00282223, cur score = 0.00288397,
worse accepted = 3.24%
Gen #574: temp = 0.000016, best score = 0.00282223, cur score = 0.00288773,
worse accepted = 3.22%
Gen #575: temp = 0.000016, best score = 0.00282223, cur score = 0.00290516,
worse accepted = 3.21%
Gen #576: temp = 0.000015, best score = 0.00282223, cur score = 0.00284608,
worse accepted = 2.39%
Gen #577: temp = 0.000015, best score = 0.00282223, cur score = 0.00286858,
worse accepted = 2.75%
Gen #578: temp = 0.000015, best score = 0.00282223, cur score = 0.00288165,
worse accepted = 2.49%
Gen #579: temp = 0.000015, best score = 0.00282223, cur score = 0.00287288,
worse accepted = 3.11%
Gen #580: temp = 0.000015, best score = 0.00282223, cur score = 0.00287122,
worse accepted = 2.21%
Gen #581: temp = 0.000015, best score = 0.00282223, cur score = 0.00286772,
worse accepted = 2.51%
Gen #582: temp = 0.000015, best score = 0.00282223, cur score = 0.00286967,
worse accepted = 2.60%
Gen #583: temp = 0.000014, best score = 0.00282223, cur score = 0.00286381,
worse accepted = 2.55%
Gen #584: temp = 0.000014, best score = 0.00282223, cur score = 0.00289084,
worse accepted = 2.66%
Gen #585: temp = 0.000014, best score = 0.00282223, cur score = 0.00285758,
worse accepted = 2.50%
Gen #586: temp = 0.000014, best score = 0.00282223, cur score = 0.00283609,
worse accepted = 2.27%
Gen #587: temp = 0.000014, best score = 0.00282223, cur score = 0.00289179,
worse accepted = 2.12%
Gen #588: temp = 0.000014, best score = 0.00282223, cur score = 0.00284164,
worse accepted = 2.14%
Gen #589: temp = 0.000014, best score = 0.00282223, cur score = 0.00288986,
worse accepted = 2.04%
Gen #590: temp = 0.000013, best score = 0.00282223, cur score = 0.00293887,
worse accepted = 2.32%
Gen #591: temp = 0.000013, best score = 0.00282223, cur score = 0.00285953,
worse accepted = 1.81%
Gen #592: temp = 0.000013, best score = 0.00282223, cur score = 0.00286538,
worse accepted = 2.00%
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Gen #593: temp = 0.000013, best score = 0.00282223, cur score = 0.00288255,
worse accepted = 2.05%
Gen #594: temp = 0.000013, best score = 0.00282223, cur score = 0.00287435,
worse accepted = 2.01%
Gen #595: temp = 0.000013, best score = 0.00282223, cur score = 0.00286428,
worse accepted = 1.95%
Gen #596: temp = 0.000013, best score = 0.00282223, cur score = 0.00289309,
worse accepted = 1.52%
Gen #597: temp = 0.000013, best score = 0.00282217, cur score = 0.00283129,
worse accepted = 1.68%
Gen #598: temp = 0.000012, best score = 0.00282217, cur score = 0.00286927,
worse accepted = 1.64%
Gen #599: temp = 0.000012, best score = 0.00282217, cur score = 0.00287221,
worse accepted = 1.55%
Gen #600: temp = 0.000012, best score = 0.00282217, cur score = 0.00284458,
worse accepted = 1.51%
Gen #601: temp = 0.000012, best score = 0.00282217, cur score = 0.00284463,
worse accepted = 1.96%
Gen #602: temp = 0.000012, best score = 0.00282217, cur score = 0.00289839,
worse accepted = 1.69%
Gen #603: temp = 0.000012, best score = 0.00282217, cur score = 0.00286004,
worse accepted = 1.53%
Gen #604: temp = 0.000012, best score = 0.00282217, cur score = 0.00283229,
worse accepted = 1.88%
Gen #605: temp = 0.000012, best score = 0.00282217, cur score = 0.00287779,
worse accepted = 1.49%
Gen #606: temp = 0.000011, best score = 0.00282217, cur score = 0.00283183,
worse accepted = 1.71%
Gen #607: temp = 0.000011, best score = 0.00282217, cur score = 0.00284665,
worse accepted = 1.38%
Gen #608: temp = 0.000011, best score = 0.00282217, cur score = 0.00288648,
worse accepted = 1.54%
Gen #609: temp = 0.000011, best score = 0.00282217, cur score = 0.00283880,
worse accepted = 1.41%
Gen #610: temp = 0.000011, best score = 0.00282217, cur score = 0.00285310,
worse accepted = 1.35%
Gen #611: temp = 0.000011, best score = 0.00282217, cur score = 0.00287309,
worse accepted = 1.13%
Gen #612: temp = 0.000011, best score = 0.00282217, cur score = 0.00283506,
worse accepted = 0.97%
Gen #613: temp = 0.000011, best score = 0.00282217, cur score = 0.00286345,
worse accepted = 1.42%
Gen #614: temp = 0.000011, best score = 0.00282217, cur score = 0.00285170,
worse accepted = 1.35%
Gen #615: temp = 0.000010, best score = 0.00282217, cur score = 0.00284032,
worse accepted = 1.37%
Gen #616: temp = 0.000010, best score = 0.00282217, cur score = 0.00283435,
worse accepted = 1.10%
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Gen #617: temp = 0.000010, best score = 0.00282217, cur score = 0.00284261,
worse accepted = 1.11%
Gen #618: temp = 0.000010, best score = 0.00282217, cur score = 0.00284279,
worse accepted = 1.13%
Gen #619: temp = 0.000010, best score = 0.00282217, cur score = 0.00283612,
worse accepted = 1.05%
Gen #620: temp = 0.000010, best score = 0.00282217, cur score = 0.00284021,
worse accepted = 1.16%
Gen #621: temp = 0.000010, best score = 0.00282217, cur score = 0.00286219,
worse accepted = 0.93%
Gen #622: temp = 0.000010, best score = 0.00282217, cur score = 0.00287186,
worse accepted = 1.29%
Gen #623: temp = 0.000010, best score = 0.00282217, cur score = 0.00284549,
worse accepted = 0.83%
Gen #624: temp = 0.000010, best score = 0.00282217, cur score = 0.00284298,
worse accepted = 0.77%
Gen #625: temp = 0.000009, best score = 0.00282217, cur score = 0.00285618,
worse accepted = 1.02%
Gen #626: temp = 0.000009, best score = 0.00282217, cur score = 0.00284857,
worse accepted = 1.05%
Gen #627: temp = 0.000009, best score = 0.00282217, cur score = 0.00284264,
worse accepted = 1.09%
Gen #628: temp = 0.000009, best score = 0.00282217, cur score = 0.00283025,
worse accepted = 0.78%
Gen #629: temp = 0.000009, best score = 0.00282217, cur score = 0.00283747,
worse accepted = 0.93%
Gen #630: temp = 0.000009, best score = 0.00282217, cur score = 0.00284721,
worse accepted = 0.76%
Gen #631: temp = 0.000009, best score = 0.00282217, cur score = 0.00283310,
worse accepted = 1.06%
Gen #632: temp = 0.000009, best score = 0.00282217, cur score = 0.00284300,
worse accepted = 0.98%
Gen #633: temp = 0.000009, best score = 0.00282217, cur score = 0.00285472,
worse accepted = 0.77%
Gen #634: temp = 0.000009, best score = 0.00282217, cur score = 0.00283911,
worse accepted = 0.73%
Gen #635: temp = 0.000009, best score = 0.00282217, cur score = 0.00286499,
worse accepted = 0.96%
Gen #636: temp = 0.000008, best score = 0.00282217, cur score = 0.00283898,
worse accepted = 0.92%
Gen #637: temp = 0.000008, best score = 0.00282217, cur score = 0.00285887,
worse accepted = 0.67%
Gen #638: temp = 0.000008, best score = 0.00282217, cur score = 0.00285433,
worse accepted = 0.66%
Gen #639: temp = 0.000008, best score = 0.00282217, cur score = 0.00284261,
worse accepted = 0.54%
Gen #640: temp = 0.000008, best score = 0.00282217, cur score = 0.00282844,
worse accepted = 0.47%
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Gen #641: temp = 0.000008, best score = 0.00282217, cur score = 0.00284641,
worse accepted = 0.63%
Gen #642: temp = 0.000008, best score = 0.00282217, cur score = 0.00284013,
worse accepted = 0.79%
Gen #643: temp = 0.000008, best score = 0.00282217, cur score = 0.00283652,
worse accepted = 0.57%
Gen #644: temp = 0.000008, best score = 0.00282217, cur score = 0.00282965,
worse accepted = 0.72%
Gen #645: temp = 0.000008, best score = 0.00282217, cur score = 0.00286414,
worse accepted = 0.62%
Gen #646: temp = 0.000008, best score = 0.00282217, cur score = 0.00285979,
worse accepted = 0.72%
Gen #647: temp = 0.000008, best score = 0.00282217, cur score = 0.00284880,
worse accepted = 0.66%
Gen #648: temp = 0.000007, best score = 0.00282217, cur score = 0.00289562,
worse accepted = 0.70%
Gen #649: temp = 0.000007, best score = 0.00282217, cur score = 0.00285091,
worse accepted = 0.83%
Gen #650: temp = 0.000007, best score = 0.00282217, cur score = 0.00285010,
worse accepted = 0.88%
Gen #651: temp = 0.000007, best score = 0.00282217, cur score = 0.00284736,
worse accepted = 0.75%
Gen #652: temp = 0.000007, best score = 0.00282217, cur score = 0.00285978,
worse accepted = 0.41%
Gen #653: temp = 0.000007, best score = 0.00282217, cur score = 0.00287089,
worse accepted = 0.63%
Gen #654: temp = 0.000007, best score = 0.00282217, cur score = 0.00283229,
worse accepted = 0.51%
Gen #655: temp = 0.000007, best score = 0.00282217, cur score = 0.00283592,
worse accepted = 0.45%
Gen #656: temp = 0.000007, best score = 0.00282217, cur score = 0.00283061,
worse accepted = 0.41%
Gen #657: temp = 0.000007, best score = 0.00282217, cur score = 0.00282553,
worse accepted = 0.63%
Gen #658: temp = 0.000007, best score = 0.00282217, cur score = 0.00282503,
worse accepted = 0.24%
Gen #659: temp = 0.000007, best score = 0.00282217, cur score = 0.00283326,
worse accepted = 0.29%
Gen #660: temp = 0.000007, best score = 0.00282217, cur score = 0.00285295,
worse accepted = 0.33%
Gen #661: temp = 0.000007, best score = 0.00282217, cur score = 0.00285797,
worse accepted = 0.36%
Gen #662: temp = 0.000007, best score = 0.00282217, cur score = 0.00285483,
worse accepted = 0.35%
Gen #663: temp = 0.000006, best score = 0.00282217, cur score = 0.00282672,
worse accepted = 0.42%
Gen #664: temp = 0.000006, best score = 0.00282217, cur score = 0.00284002,
worse accepted = 0.57%
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Gen #665: temp = 0.000006, best score = 0.00282217, cur score = 0.00283445,
worse accepted = 0.24%
Gen #666: temp = 0.000006, best score = 0.00282217, cur score = 0.00282648,
worse accepted = 0.22%
Gen #667: temp = 0.000006, best score = 0.00282217, cur score = 0.00284256,
worse accepted = 0.33%
Gen #668: temp = 0.000006, best score = 0.00282217, cur score = 0.00285728,
worse accepted = 0.26%
Gen #669: temp = 0.000006, best score = 0.00282217, cur score = 0.00286581,
worse accepted = 0.40%
Gen #670: temp = 0.000006, best score = 0.00282217, cur score = 0.00282291,
worse accepted = 0.37%
Gen #671: temp = 0.000006, best score = 0.00282217, cur score = 0.00282645,
worse accepted = 0.36%
Gen #672: temp = 0.000006, best score = 0.00282217, cur score = 0.00285108,
worse accepted = 0.11%
Gen #673: temp = 0.000006, best score = 0.00282217, cur score = 0.00286012,
worse accepted = 0.35%
Gen #674: temp = 0.000006, best score = 0.00282217, cur score = 0.00285355,
worse accepted = 0.34%
Gen #675: temp = 0.000006, best score = 0.00282217, cur score = 0.00282701,
worse accepted = 0.21%
Gen #676: temp = 0.000006, best score = 0.00282217, cur score = 0.00282480,
worse accepted = 0.23%
Gen #677: temp = 0.000006, best score = 0.00282217, cur score = 0.00283866,
worse accepted = 0.12%
Gen #678: temp = 0.000006, best score = 0.00282217, cur score = 0.00282881,
worse accepted = 0.31%
Gen #679: temp = 0.000005, best score = 0.00282217, cur score = 0.00283888,
worse accepted = 0.26%
Gen #680: temp = 0.000005, best score = 0.00282217, cur score = 0.00284326,
worse accepted = 0.31%
Gen #681: temp = 0.000005, best score = 0.00282217, cur score = 0.00284878,
worse accepted = 0.35%
Gen #682: temp = 0.000005, best score = 0.00282217, cur score = 0.00283244,
worse accepted = 0.11%
Gen #683: temp = 0.000005, best score = 0.00282217, cur score = 0.00284001,
worse accepted = 0.19%
Gen #684: temp = 0.000005, best score = 0.00282217, cur score = 0.00283800,
worse accepted = 0.33%
Gen #685: temp = 0.000005, best score = 0.00282217, cur score = 0.00283676,
worse accepted = 0.19%
Gen #686: temp = 0.000005, best score = 0.00282217, cur score = 0.00283012,
worse accepted = 0.10%
Gen #687: temp = 0.000005, best score = 0.00282217, cur score = 0.00283086,
worse accepted = 0.15%
Gen #688: temp = 0.000005, best score = 0.00282217, cur score = 0.00283569,
worse accepted = 0.29%
```

```
[97]: best_sol
```

```
[97]: (2.0025702338411326, 0.281986151674571, 0.05000440580999947)
```

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[ ]:
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[ ]:
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[ ]:
```

```
[99]: sol = best_sol
      print(g1(*sol), g2(*sol), g3(*sol), g4(*sol))
```

```
-0.000540241178286438 -0.23561867573374795 -43.10488527213303 -0.778672961676953
```

```
[100]: score(*sol)
```

```
[100]: 0.0028221707348116552
```

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[ ]:
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[ ]:
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[ ]:
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[ ]:
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[ ]:
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[ ]:
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[ ]:
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